TELE-PATH IND 550A

ISDN PORTABLE TEST SET
MET23920

A Division of TTC

A Dynatech Company

TPIP 550A
Manual Issue # 18C
Firmware Rev. 5.10N

TELE-PATH INSTRUMENTS
ISDN PORTABLE TEST SET
MODEL 550A
OPERATING MANUAL

TELE-PATH INSTRUMENTS
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ISO 9001 Quality System

TPI A Division of TTC A Dynatech Company
TELE-PATH INSTRUMENTS

TABLE OF CONTENTS

CONTENTS **PAGE**

SECTION I - INTRODUCTION

1.1 GENERAL INFORMATION 1- 1
1.1.1 BASIC RATE ISDN 1- 2
1.2 PHYSICAL DESCRIPTION 1- 6
1.2.1 EXTERNAL CONNECTIONS 1- 7
1.2.2 CONTROLS AND INDICATORS 1- 8
DATA ACCESS 1- 9
POWER 1-11
LINE INTERFACE AREA 1-13
STATUS LED's 1-15
S/T INTERFACE AREA 1-17
1.2.3 MENUS AND KEYPAD 1-20
RESULTS 1-22
AUTO 1-23
TIMER 1-24
BERT 1-26
SPID 1-30
FEATURE 1-32
INTERFACE 1-36
STATUS 1-37
STORE 1-47
REDIAL 1-48
SPEED DIAL 1-49
UTILITY 1-50
HOOK ON/OFF 1-63
SETUP 1-75

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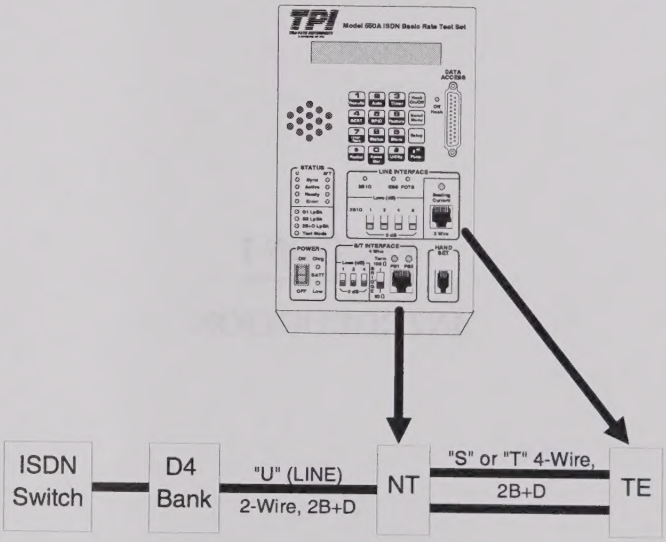
SECTION I

INTRODUCTION

TPI Model 550A
ISDN Basic Rate Test Set



1.1 GENERAL INFORMATION

The Tele-Path Model 550A ISDN Basic Rate Test Set is a compact, battery operated device used to conduct testing of ISDN circuits at the customer premise or main distribution frame. The Model 550A is designed both for rugged durability and ease of use, with menu driven screens.

The Model 550A's operating modes allow it to function as an NT1 (Network Termination), as TE (Terminal Equipment), or as both. It may be connected to either the DSL (Digital Subscriber Loop), or the S/T interface. It is compatible with 2B1Q DSL, EBS (P-Phone), and POTS Line Interfaces. The Model 550A allows placement of additional loss on the circuit, either at the "LINE" or the "S/T" interface.

The Model 550A ISDN Basic Rate Test Set allows you to establish a loopback in either of the B channels, or on the full bandwidth (2B+D).

Measurements made by the Model 550A include:

- FEBE (Far End Block Errors) and FEBE Errored Seconds in all ISDN interface modes except NT1
- CRC Errors and CRC Errored Seconds with 2B1Q Interface selected
- AMI Frame Errors and Frame Errored Seconds with AMI interface selected (no longer available)
- S/T FRAME Errors and Errored Seconds, and BPV's and Errored Seconds on the S/T Interface in NT1 and TE modes

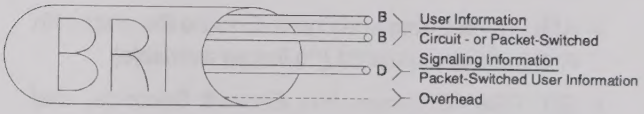
1.1.1 BASIC RATE ISDN

INTRODUCTION

ISDN today is a Digital Network which promises a wide range of enhanced services, including Voice, Data, and Image. While ISDN customers may subscribe to either the Primary Rate Interface (PRI) service, or the Basic Rate Interface (BRI) service, BRI has the most immediate application since it is designed to connect Terminal Equipment to the Integrated Services Digital Network (ISDN).

ISDN BASIC RATE INTERFACE

ISDN divides a standard 2-wire non-loaded telephone line into three Digital Channels capable of simultaneous Voice, Data, and low speed Video transmission. The three Channels are comprised of two Bearer (B) Channels, which carry Voice, Circuit-Switched, or Packet-Switched Data up to 64 Kbps, and a 16 Kbps Data (D) Channel for Packet-Switched Data and Signaling information. When combined, the two B-Channels and one D-Channel make up the Basic Rate (2B+D) Access. A Maintenance Channel and Framing information are added, and the result is a transmission rate of 160 Kbps at the "U" Interface. See Figure 1 below:



2B (128K) + D (16K) = 144 Kbps + Overhead (16K) = 160 Kbps @ "U" Interface
2B (128K) + D (16K) = 144 Kbps + Overhead (48K) = 192 Kbps @ "S/T" Interface

Figure 1. ISDN Basic Rate Interface

A typical configuration for ISDN Basic Rate Access is shown in Figure 2 below.

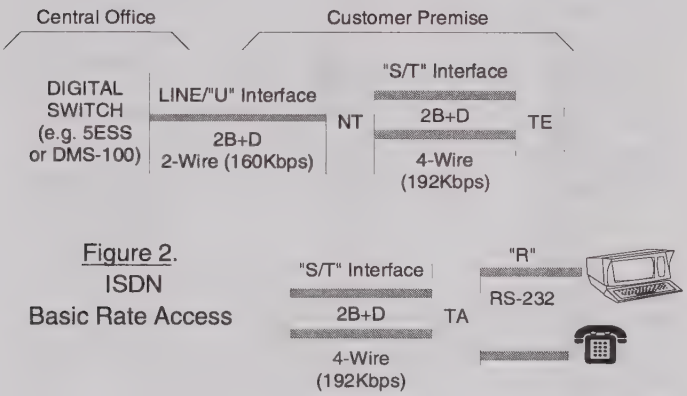


Figure 2.
ISDN
Basic Rate Access

LINE/"U" Interface

The "U" Interface refers to the physical interface on the Network side of an NT1. It is a 2-wire interface that uses an echo cancelling technique to transmit and receive information over the same pair of wires.

Approximate Cable Length* for dB Loss on "U" Interface Pads		
	2B1Q	**AMI**
1 dB	367	308
2 dB	735	617
3 dB	1102	925
4 dB	1470	1234
5 dB	1838	1543
6 dB	2205	1851
7 dB	2573	2160
8 dB	2941	2469
9 dB	3308	2777
10 dB	3676	3086
11 dB	4404	3395
12 dB	4411	3703
13 dB	4779	4012
14 dB	5147	4320
15 dB	5514	4629

* 26 gauge cable

(NT) Network Termination

Network Termination (NT1) is the Customer Premises termination equipment that converts the 2-wire "U" Interface signal to a 4-wire "S/T" Interface signal. The NT1 also provides some simplified looping capabilities for testing of the facilities.

S/T Interface

The S/T Interface is the standard ISDN Interface used by ISDN Terminals and is the physical interface on the Terminal side of an NT1. It is a 4-wire transmission interface, with one pair used to transmit and one pair used to receive, at a rate of 192 Kbps.

(TE) Terminal Equipment

Terminal Equipment is a Customer ISDN Terminal that operates when connected to an ISDN Basic Rate Access Interface, either a "U" or an "S/T". Examples are Digital Telephones, Data Terminals, and Integrated Work Stations.

Other kinds of Customer Terminals which operate from a non-ISDN Interface (RS-232), would need a Terminal Adapter (TA) to convert from the non-ISDN Interface to the appropriate ISDN Interface.

2B1Q Line Code

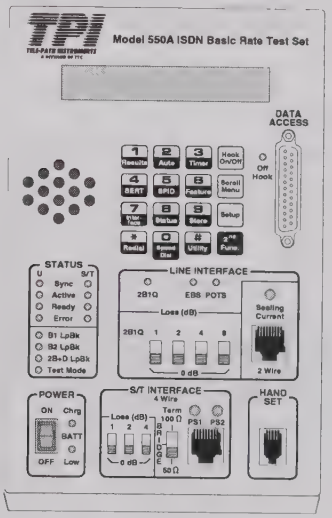
The ANSI "U" Interface incorporates a 2B1Q Line Code, which is the electrical representation of digital signaling, and represents the pattern of pulses carried across the wire that forms the "1's" and "0's" transmitted. 2B1Q adds adaptive digital signal processing to this pattern of pulses, which can smooth out interference on a line to create the capability of using ordinary non-loaded twisted pair for distances of up to 18,000 feet using 26 ga. cable (- 42dB).

The major Switch vendors initially used their own proprietary Line Codes, e.g., AT&T AMI (Alternate Mark Inversion) and NTI AMI, but are now bringing 2B1Q to their products.

The 2B1Q (two Binary, one Quaternary) Line Coding is a four level, or quaternary code. Each level is determined from a single combination of two bits. Thus, 160 Kbps (binary) equates to 80 KHz. The lower frequency is desirable for extending the distance over which transmission is possible.

1.2 PHYSICAL DESCRIPTION

The TPI Model 550A ISDN Basic Rate Test Set, illustrated below, consists of circuit boards and a battery pack, housed in an aluminum case. It weighs 3½ to 4½ pounds (depending on Interfaces optioned) and has external dimensions of 8½" high, 5½" wide, and 4¼" deep for the basic unit.



The internal battery pack is a custom 12 volt lead acid rechargeable flat pack that can be externally charged via either the TPI 550A-4 or TPI 550A-14 Battery Charger/AC Adapter (depending on the interfaces optioned). A fully charged battery will typically last for eight hours of 2B1Q Interface operation. When the "**Batt. Low**" LED illuminates, there are approximately 10 minutes of operating time left before complete shutdown. At that time, the internal battery needs to be recharged with the TPI 550A-4 (TPI 825400). The recommended recharge time is 12 to 14 hours (overnight).

An aluminum hinged cover is attached to the unit to protect the control panel when the unit is being transported. The cover is secured by a latch that snaps loose and unhooks.

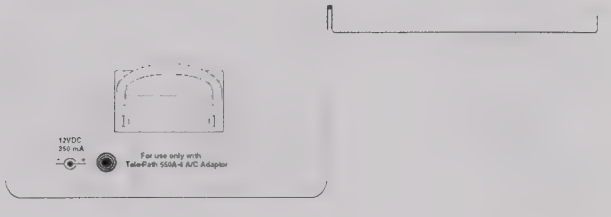
A D-ring is attached to the top of the unit for convenience to allow attachment of the portable set to a line up rack. (A clip hook is provided in the soft pack carry case.)

The hinged cover houses a lid Test Summary Label that details unit operation.

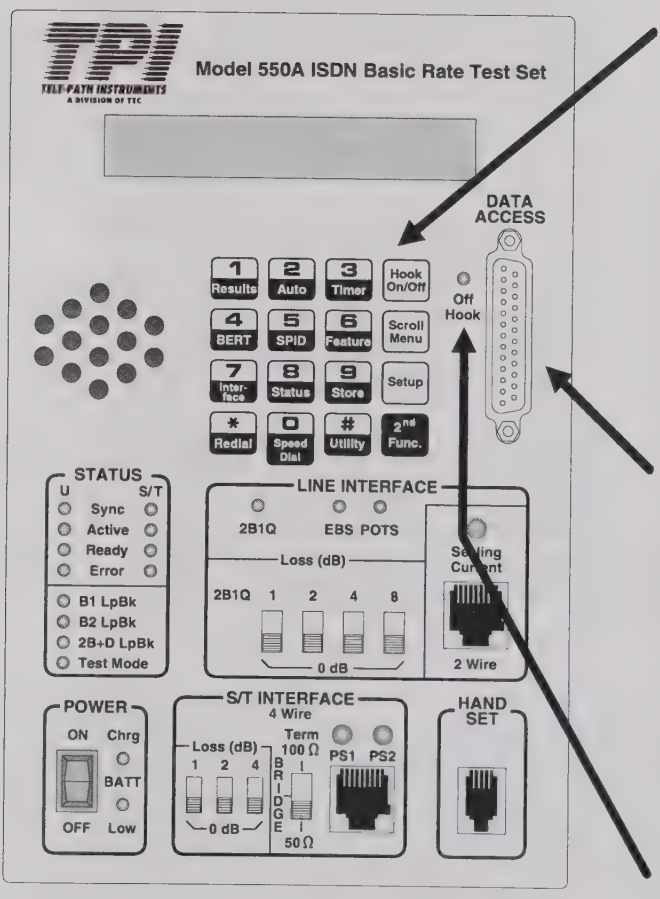
1.2.1 EXTERNAL CONNECTIONS

Connections to the DSL (LINE) Interface and S/T Interface are made on the front panel. Connection for an external Hand Set, TPI 550A-8 (TPI 835090), may also be made via the front panel modular jack provided.

As shown below, the top side of the case houses a connector for the TPI 550A-4 (TPI 825400) Battery Charger/AC Adapter, and a D-ring for attachment to a line-up rack (A clip hook attachment is provided in the Soft Pack Carry Case for the Model 550A). The right side of the case houses a microphone grid for the hands-free mode of operation.



1.2.2 CONTROLS AND INDICATORS



LCD DISPLAY AND KEYPAD

The LCD display and keypad are used to make menu selections that view test results, auto evaluate the interface, set testing parameters, conduct BERT testing, set the SPID, enable switch feature verification, select a specific interface, view the line status, setup voice and data calls, select a specific call control type, backlight the display, select a B-Channel, set the TEI, adjust the volume level, enable the D-Channel monitor function, select the call appearance, adjust the LCD contrast, initiate Loopbacks, store frequently used numbers, speed dial, and redial.

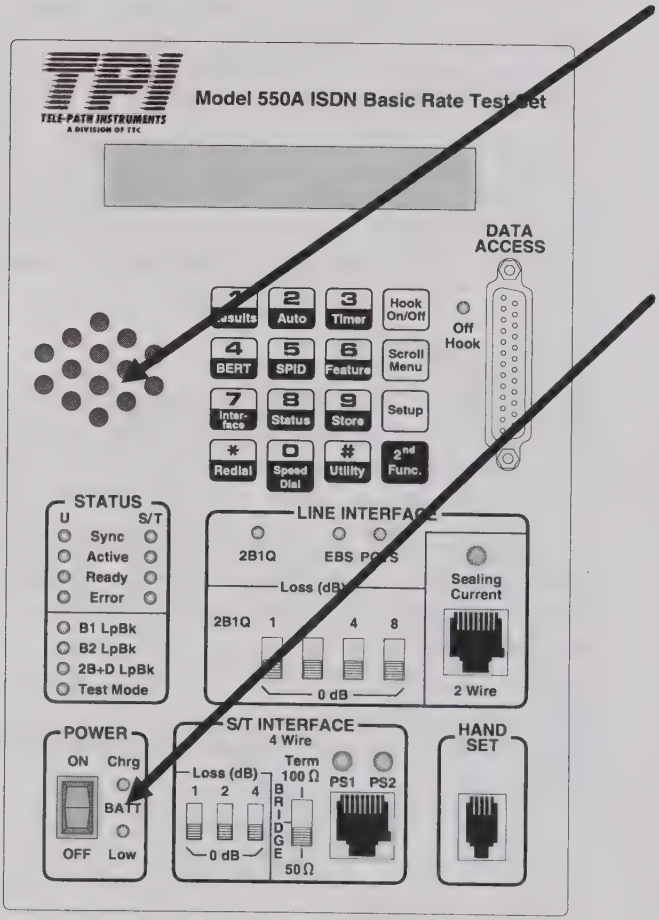
DATA ACCESS

When the "Data Capability" option is purchased, the "**DATA ACCESS**" area of the front panel will be populated with a DB25/RS-232 connector for monitoring of "D" channel packets. Information displayed will be in the HEX format and in English.

The "Data Capability" option also allows the user to choose between placing a voice call and setting up a circuit-switched data call, a D-packet data call, choosing data call speed, and performing Bit Error Testing.

OFF HOOK LED

This LED, when illuminated, indicates that the Model 550A is in a call state.


TPI
TELE-PATH INSTRUMENTS
A DIVISION OF ITC
Model 550A ISDN Basic Rate Test Set
DATA ACCESS
2 Auto
3 Timer
Hook On/Off
Off Hook
4 BERT
5 SPID
6 Feature
Scroll Menu
7 Inter-face
8 Status
9 Store
Setup
* Redial
0 Speed Dial
Utility
2nd Func.
STATUS
U
S/T
Sync
Active
Ready
Error
B1 LpBk
B2 LpBk
2B+D LpBk
Test Mode
LINE INTERFACE
2B1Q
EBS
Loss (dB)
2B1Q 1 4 8
0 dB
Sealing Current
2 Wire
POWER
ON
Chrg
BATT
OFF
Low
S/T INTERFACE
4 Wire
Loss (dB)
1 2 4
0 dB
Term 100 Ω
BRIDGE
50 Ω
PS1
PS2
HAND SET

SPEAKER

In the hands-free mode, the integral speaker produces an amplified version of received voice.

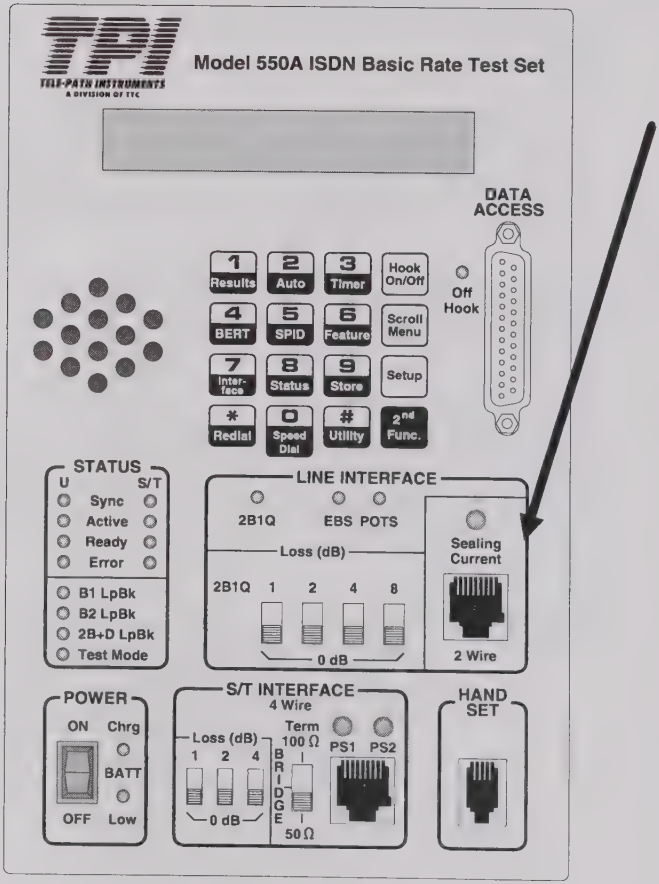
POWER

The "Power" switch is used to turn the ISDN Basic Rate Test Set "**ON**" and "**OFF**". If there is no activity (DSL sync, S/T sync, or keystroke) for 5 minutes (10 minutes for EBS/POTS), the ISDN Basic Rate Test Set will turn itself off to conserve battery life.

The "**BATT Chrg**" LED indicates that the internal battery is being charged. It will also light when the AC Adapter is plugged in.

When the "**BATT Low**" LED lights, there is approximately 10 minutes of operating time left before complete shutdown. However, if needed, the unit may still be used with the AC Adapter. This will give power to the unit and recharge the batteries, but at a slower rate than when the unit is not in operation.

CAUTION: *The 10 minute low battery warning is only approximate, and will depend on several factors. To insure proper operation throughout the testing procedures, we recommend that you recharge the battery as soon as the warning LED lights (recommended recharge time is 12 to 14 hrs [overnight]).*


TPI
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Model 550A ISDN Basic Rate Test Set
DATA ACCESS
1 Results
2 Auto
3 Timer
Hook On/Off
Off Hook
4 BERT
5 SPID
6 Feature
Scroll Menu
7 Inter-face
8 Status
9 Store
Setup
* Redial
0 Speed Dial
Utility
2nd Func.
STATUS
U
S/T
Sync
Active
Ready
Error
B1 LpBk
B2 LpBk
2B+D LpBk
Test Mode
LINE INTERFACE
2B1Q
EBS POTS
Loss (dB)
2B1Q 1 2 4 8
0 dB
Sealing Current
2 Wire
POWER
ON
Chrg
BATT
OFF
Low
S/T INTERFACE
4 Wire
Loss (dB)
1 2 4
0 dB
Term
100 Ω
BRIDGE
50 Ω
PS1
PS2
HAND SET

LINE INTERFACE Area

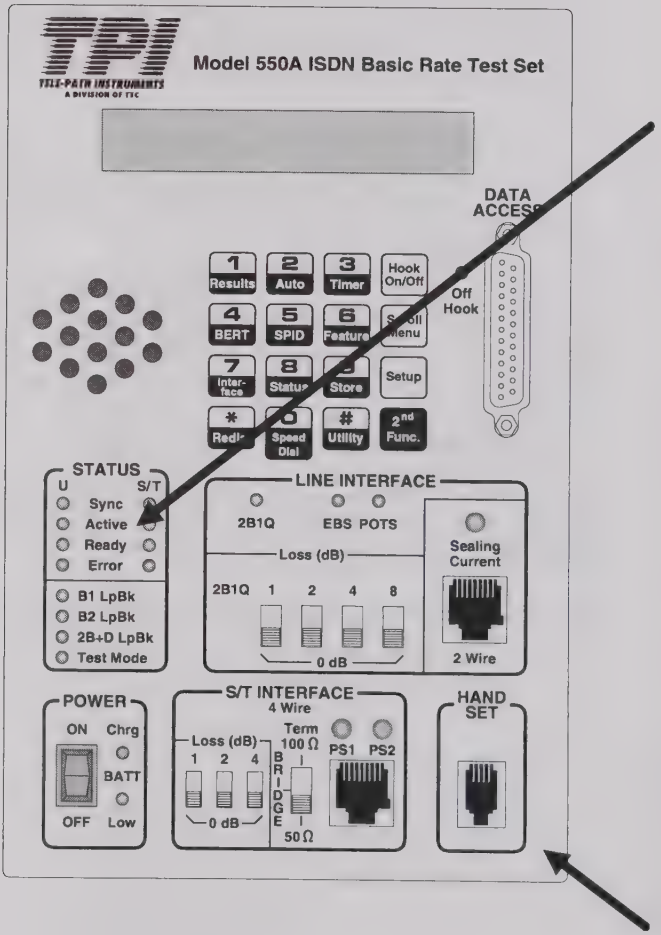
This area of the front panel is used to make connection to the Line Interface when the ISDN Basic Rate Test Set is in the NT1 or NT1/TE mode. It is comprised of interface LED's, a set of loss switches, a sealing current indicator, and a modular 8 pin connector.

The **LINE INTERFACE** LED's indicate the active Line Interface. Please note that if an interface has not been installed on your Test Set, the LED for that interface will not light and that interface will not activate.

The "**Loss**" switches are used to place additional loss on the line. The amount of loss that can be placed on the line without degrading the transmission will indicate if the circuit is marginal. By activating more than one of these switches, you can place more loss on the line. For example, a 9 dB loss may be obtained by activating both the 1 and 8 dB switches.

The "**Sealing Current**" LED will light green when at least 5 mA of sealing current is detected in either polarity, except in the AT&T AMI mode (will not illuminate if reversed).

The modular 8 pin connector is used to make connection to the line.


TPI
TELE-PATH INSTRUMENTS
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Model 550A ISDN Basic Rate Test Set
DATA ACCESS
Off Hook
1 Results
2 Auto
3 Timer
Hook On/Off
4 BERT
5 SPID
6 Feature
Scroll Menu
7 Inter-face
8 Status
Store
Setup
* Redial
0 Speed Dial
Utility
2nd Func.
STATUS
U
S/T
Sync
Active
Ready
Error
B1 LpBk
B2 LpBk
2B+D LpBk
Test Mode
LINE INTERFACE
2B1Q
EBS POTS
Loss (dB)
2B1Q 1 2 4 8
0 dB
Sealing Current
2 Wire
POWER
ON
Chrg
BATT
OFF
Low
S/T INTERFACE
4 Wire
Loss (dB)
1 2 4
0 dB
Term 100 Ω
BRIDGE
50 Ω
PS1
PS2
HAND SET

STATUS LED's

The "**U**" LED's indicate sync, activity, ready, and errors detected on the "U" interface when the ISDN Basic Rate Test Set is in either NT1 or NT1/TE mode.

The "**S/T**" LED's indicate sync, activity, ready, and errors detected on the S/T interface when the ISDN Basic Rate Test Set is in either TE or NT1 mode.

NOTE: *When the ISDN Basic Rate Test Set is in the NT1/TE mode, only the "U" LED's will function. When the ISDN Basic Rate Test Set is in the TE mode, only the "S/T" LED's will function. When the ISDN Basic Rate Test Set is in the NT1 mode, both groups of LED's will function.*

If the **Error** *LED lights (steady or pulsing), accessing the RESULTS menu will display what errors are occuring.*

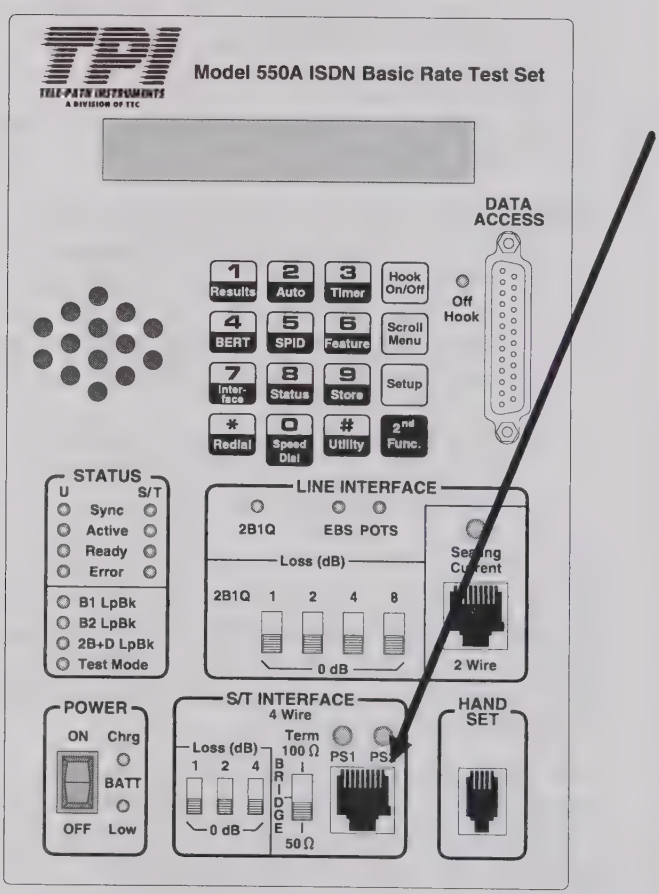
The loopback ("**LpBk**") LED's show the test states.

One of the first three LED's will light if a loopback has been remotely established by the network in the ISDN Portable Test Set, or has been manually established through the UTILITY menu. This loopback may be in either of the B channels, or across the entire 2B+D bandwidth.

The fourth LED ("**Test Mode**") will light when a remote loopback or test command has been sent to the Model 550A. Generate 2B1Q Test Signal and Quiet Mode operation will be available in future versions of the Model 550A.

HAND SET

An optional hand set, TPI 550-8 (TPI 835090), may access either B channel. Connect to the 4-pin modular jack provided.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Test Mode
LINE INTERFACE
2B1Q
EBS POTS
Loss (dB)
2B1Q 1 2 4 8
0 dB
Sealing Current
2 Wire
POWER
ON
Chrg
BATT
OFF
Low
S/T INTERFACE
4 Wire
Loss (dB)
1 2 4
0 dB
Term
100 Ω
BRIDGE
50 Ω
PS1
PS2
HAND SET

S/T INTERFACE Area

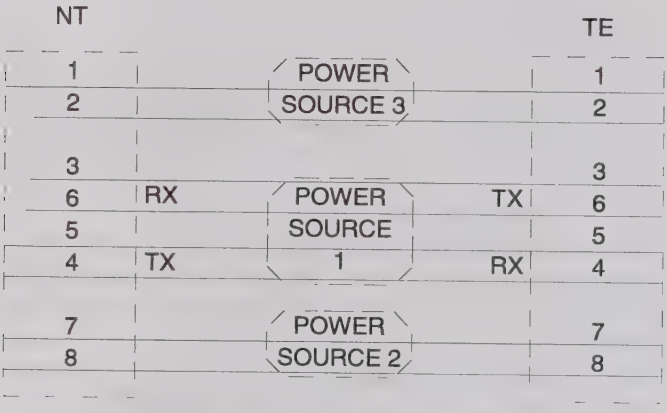
This area of the front panel is used to configure and make connection to the S or T Interface when the Model 550A is in the TE or NT1 mode. It is comprised of a set of loss switches, a termination switch, PS indicators, and a modular 8 pin connector.

The "**Loss**" switches are used to place additional loss on the transmit and receive S/T line. The amount of loss that can be placed on the line without degrading the transmission will indicate if the circuit is marginal. By activating more than one of these switches, you can place more loss on the line, e.g., selecting both the 2dB and 4dB switches yields a 6dB loss.

The termination ("**Term**") switch may be used to place either a 100Ω or a 50Ω termination on the S/T line, or in the "**BRIDGE**" position, there would be no termination.

The "**PS**" LED's show the status of Power Sources 1 & 2 (Refer to the Power Feeding diagram on the next page). These LED's will light green when their corresponding power sources have at least 30 Volts. They will light red if the polarity has been reversed on their corresponding power source.

The modular 8 pin connector is used to make connection to the S/T line.



Reference Configuration for Power Feeding

NOTE 1 *Access lead designations "1" through "8" correspond to contact assignments of the 8-pin network interface connector. Access lead pairs 4-5 and 3-6 are for bi-directional transmission of the Digital signal and may provide a phantom circuit for power transfer to a TE (Power Source 1). Access lead pair 7-8 may be used for additional power transfer to a TE (Power Source 2).*

NOTE 2 *Power Source 1, the Sealing Current power, derives its power locally (commercial power and/or batteries). The source may be an integral part of the NT.*

NOTE 3 *Power Source 2, the Stand Alone Power Pair, also derives its power locally (commercial power and/or batteries). The source may be located or associated with the NT or it may be located separately; e.g., in a remote wiring closet.*

NOTE 4 *Power Source 3 is an optional power source that may be used in some cases.*

1.2.3 MENUS AND KEYPAD

The LCD display and keypad are used to perform many functions from setting up voice and data calls to setting up and viewing test results.

Screen actions are initiated via the following keys:

1/Results - This key is used to display the results of a test.

2/Auto - This key automatically configures the Model 550A to the "U" Interface. (2B1Q only)

3/Timer - This key is used to set the test time and start/stop the Error Counts.

4/BERT - This key allows the Model 550A to conduct 2047 Bit Error Testing on B1 or B2 Channels.

5/SPID - This key is used to set the Service Profile Identifier (SPID).

6/Feature - This key is used for Switch Feature Verification when the ATT 5ESS BRITL option is in use.

7/Interface - This key allows specific interface selection.

8/Status - This key is used to review the ISDN line status.

9/Store - This key is used to store up to ten numbers for repeat use.

*/Redial - This key is used to redial the last number

0/Speed Dial - This key is used to recall a stored number for speed dial operations.

#/Utility - This key is used to select a specific call control type, select the LCD screen Backlight, to select the "B" channel, to select Bearer capability (when optioned) for voice or data (and if data, speed, service, and D-packet may also be selected), adjust the volume, to enable the RS-232 packet data monitor function (when optioned), to set the Call Appearance, to select a NTI Stimulus Release Number, adjust LCD contrast, enable B1, B2, or 2B+D Loopbacks, and to select the TEI mode (Auto/Fixed).

Hook On/Off - This key is used to set up/release a call.

Scroll Menu - This key is used to scroll through sub menu selections of the selected menu.

Setup - This key allows the user to review the current setup configuration and accept it, or respond to menu prompts to change the setup.

2^{nd} Func. - This key is used to give other keys a 2^{nd} function.

1/Results Key

This key allows access to the Test Results menu, displayed below:

```
TEST RESULTS
XXX 00:10:00 XXX
```

The first line represents the menu. The second line represents the default time (10 minutes) and error counters (which count until access is gained to a circuit, or when there are errors).

As you press the "**Scroll Menu**" key, the "TEST RESULTS" choices will appear. If a test is in progress, the "XXX" will be replaced by the actual error counts.

Test Results selections are:

CRC ERR & CRC ES
FEBE ERR & FEBE ES
AMI FE & AMI FE ES
S/T FE & S/T FE ES
S/T BPV & S/T BPV ES

To exit the "**1/Results**" menu, press "**Setup**" and "**1**" to accept.

2/Auto Key

This key allows auto configuration to the "U" 2B1Q Interface. If you select item "**2/Auto**" on the keypad, the following screen will be shown:

```
AUTO
SELECTING U INTERFACE
```

When the Line Interface has been evaluated, the unit setup configuration will be changed to reflect the interface evaluated and the LCD screen will report that configuration, for example:

```
AUTO COMPLETE
SELECTED 2B1Q
```

To exit the "**2/Auto**" menu, press any keypad selection.

3/Timer Key

This key allows the Error Counts to be started or stopped and the test time to be set . If you select item "**3/Timer**" on the keypad, the following screen will be shown:

```
ERROR COUNTS STOPPED
1=START  2=STOP
```

This menu reports the current state of the Error Counts as "Stopped" or "Started" and allows a change. If you do not wish to change this setting, press "**Scroll Menu**". The following menu will result:

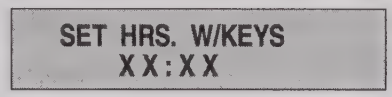
```
SET MIN. W/KEYS
    XX:XX
```

You may now set the number of minutes in a timed test by pressing the numeric keys. Exiting this menu selects the time displayed. When "Minutes" are entered, the menu automatically scrolls to "Set Hours".

Please note that when entering the number, the entry will alternate from the "tens" position to the "ones" position, on the minutes side. A maximum of 59 minutes can be selected; if you press any number higher than a 5 for the first number, nothing will happen.

Timed tests merely freeze the error counts after time has expired.

If you do not wish to change this number, press "**Scroll Menu**".



You may now set the number of hours in a timed test by pressing the numeric keys. Exiting this menu selects the time displayed. Please note that when entering the number, the entry will alternate from the "tens" position to the "ones" position, on the hours side. A maximum of 99 hours can be selected.

If you do not wish to change this number, press "**Scroll Menu**".

To exit the "TIMER" menu, press "**Setup**" and "**1**" to accept.

4/BERT Key

This key allows Bit Error Testing on either of the "B" Channels (when optioned for Data Capability).

NOTE: *If the "Data Capability" option has not been ordered, the menu will display "NOT OPTIONED".*

If you select item "**4/BERT**" on the keypad, the following menu will result:

```
BE   0 ES    0   00:00:00
1=STRT/CLR 2=STOP 3=6ERR
```

The Bit Error Test may now be started and/or stopped from this menu.

Pressing "**Scroll Menu**" will display the following menu:

```
2047  XX  64K     00:00:00
1=B1  2=B2
```

The channel selected will be displayed (XX) on the top line and may also be changed.

Upon selection of a "B" Channel or the "**Scroll Menu**" key, the following menu will be displayed:

```
2047  B1  XXX     00:00:00
1=56K       2=64K
```

The data rate selected will be displayed (XX) on the top line and may also be changed.

Selection of a data rate or pressing "**Scroll Menu**" will return to the first menu.

To exit this menu, press "**Setup**" and "**1**" to accept.

BER Testing

To conduct BER Testing, perform the following:

1) Press the "**#/Utility**" key.

2) Press "**Scroll Menu**" until the "BEARER CAP" menu is displayed.

3) Select "2=**DATA**".

4) Place a call:

   A - Go off hook by pressing the "**Hook On/Off**" key ("Off Hook" LED will light).
   B - Enter the number using the keypad (LCD screen will display number entered and channel connected).

5) Press "**2nd Func.**" followed by "**BERT**".

6) Check the Speed and B-Channel.

   - B-Channel should be the B-Channel shown when the call was connected.
   - Speed should be 64K for Clear Channel Testing and 56K for Non-Clear.

7) Start the BER Test by pressing "1=**STRT/CLR**". There will be a burst of bit errors (BE).

8) Press "1=**STRT/CLR**" soft key again to clear the initial errors. Press "3=**6ERR**" to insert 6 bit errors into the transmit pattern.

9) Run the test for a desired amount of time and determine if total errors is acceptable (see your company policy).

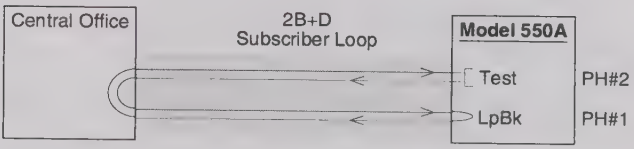
10) Press "2=**STOP**" or "**Hook On/Off**" to end the test.

The dual call feature of the Model 550A enables BER tests to be conducted on both B-channels simultaneously, thus testing the full 128K bandwidth. This testing can be accomplished in two scenarios.

LOOPBACK:

With each B-channel having a dialable number, turn the "Second Call" feature ON in the "**Utility**" menus, press "**2nd Func.**" then "**5/SPID**" key, and enter SPID #1 and SPID #2. Press the "**Hook**" key to return to the Hook screen for PH#1 (Phone 1) and press "**Scroll Menu**" to reach the PH #2 Hook screen. Go Off Hook and dial the number for phone #1.

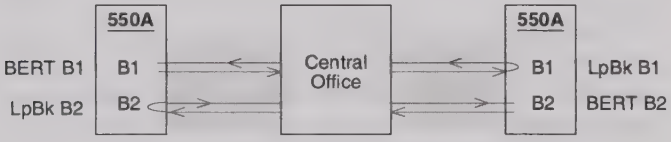
When the sonalert is heard, press "**Scroll Menu**" to move to Phone #1, press the "**Hook On/Off**" key to answer the call. Place the "called" B-channel into loopback mode, enter the BERT menu, and start a test over the "calling" B-channel (the PH#2 call B-channel).



NOTE: *If the "Second Call" feature is ON, a call can be placed out to the switch and back to the second B-channel. Then one of the channels may be placed in loopback ("**Utility**" menu, "**Scroll Menu**" to "B1, B2, or 2B+D LB" display), and BERT testing initiated over the other B-channel. Thus, both B-channels can be tested at the same time.*

STRAIGHTAWAY:

In the same manner as above, two technicians with Model 550A's can call each other. In this scenario, the first would call the second technician. The second technician would then call the first, using the PH#2 Hook screen. The called technician would place the incoming B-channel in loopback. Each technician would then initiate BER testing over the out-bound B-channel.



5/SPID Key

NOTE: *If the service is AT&T multipoint or NTI Functional, a SPID (Service Profile Identifier) will have to be set via menu "5/SPID".*

A Service Profile Identifier (SPID) is utilized by Terminal Equipment (TE) to request initialization from the switch on a multipoint circuit. This menu allows that identification number to be set or changed.

If you select Item "**5/SPID**" on the keypad, the following screen will result:

The second line represents the present SPID number.

Your particular Service Profile Identifier (SPID) may now be entered using the keypad. (Pressing "**2nd Func.**", then "**Scroll Menu**" deletes the last digit entered.)

At present, for 5ESS, the SPID is formed by adding "01" to the beginning of the 7-digit number and followed with a "0". (As an example, "0137505000" is the SPID for Telephone Number 540-375-0500.)

For NTI Functional (DMS-F), the SPID is the 10-digit primary directory number plus an optional two-digit suffix. (For example, "5403750500 00".)

The Terminal Identifier (TID) is required for National translations and is entered as part of the SPID. The TID is a two-digit number from 00-63. (For example, for 5ESS, "01375050011" would be the SPID for the number above, after adding "11" as the TID. For NTIF, the SPID would be "54037505000011"

The call control routine may now be continued for access to the multipoint line by connecting the Model 550A to the appropriate interface and pressing the "**Hook On/Off**" key.

DUAL CALL Feature

There are two configurations or "Setup" selections used in making a "Dual B-Channel" call. They involve the use of the TEI (Terminal Endpoint Identifier) selection as single or dual and the use of one or two SPID's (Service Profile Identifier), described below:

Dual B-Channel Calls with the 5ESS switch:

Lines configured as Point-to-Point configuration, custom or National ISDN, use one TEI and one SPID to establish a dual B-Channel data call. Dual B-Channel voice calls are not allowed.

Lines configured as multi-point configuration, custom or National ISDN, use two TEI's and two SPIDs. Voice or Data bearer service is allowed.

Dual B-Channel Calls with other switches:

All other switches, whether in Custom call control or not, require the use of two SPIDs. Both Voice and Data bearer service is allowed.

To exit the "**5/SPID**" menu, press "**Setup**" and "**1**" to accept.

6/Feature Key

This key allows switch feature verification for AT&T 5ESS switches when using the BRITL capability described below.

NOTE: *The Model 550A must be connected the line for Feature Verification.*

A Basic Rate Interface Dial-Up Test Line (BRITL) feature of AT&T switches provides a means by which the craftsperson can test operation of a BRI (Basic Rate Interface) from the customer side (CPE) of a BRI. By placing a test call to a pre-assigned Directory Number, the craftsperson may gain access to a set of test commands via the CPE keypad, e.g., the Model 550A keypad. These commands will allow the Basic Rate Interface to be tested without additional craft support at the Central Office.

When the "**2nd Func.**" key is pressed, then followed by pressing the "**6/Feature**" key, switch feature verification will be enabled. At this point, any button number may be entered via the keypad, followed by "#". The LCD will then display what that button number has been translated for by the switch. This procedure may be repeated for other button numbers.

To exit the "FEATURE VERIFICATION" menu, press "**Setup**" and "**1**" to accept.

The Model 550A can also be utilized to go off hook and dial the BRI Test Line access code:

1 Press the "**Hook On/Off**" key to go off hook
2 Upon hearing dial tone, dial the BRI Test Line access code using the keypad
3 A secondary dial tone will be heard and a display message will indicate successful origination of the Test Line
4 BRI Dial-Up Test Line keypad codes may now be used to exercise the set of commands available

NOTE: *The BRITL Access Number may be conveniently stored in one of the speed dial locations for quick recall (access).*

Valid BRI Dial-Up Test Line (BRITL) keypad codes are as follows (when the switch is provisioned with 5E6 software releases):

KEYPAD	ACTION
*11X#	Run BER Test on Channel X with Current Parameter
*120#	Display Current Test Termination
*12X#	Set Test Termination
*130#	Display Current Test Duration
*13X#	Set Test Duration
*140#	Display Current Test Data Rate
*14X#	Set Test Data Rate
*2#	Send Alerting Signal to the CPE
*3#	Print LCEN on CPE display
*4#	Print Primary DN/MLHG on CPE display
*0#	Repeat Previous Message (Display/Tone)

As an example, enter "*3#" on the keypad. The Line Card Equipment Number of the BRI will be displayed on the Model 550A LCD screen.

Valid BRI Dial-Up Test Line (BRITL) parameters are listed below:

COMMAND SUFFIX X	KEYPAD CODE *11X	KEYPAD CODE *12X	KEYPAD CODE *13X	KEYPAD CODE *14X
1	B1	CPE	20 Sec.	64K Clear
2	B2	NT1	2 Min.	64K Restrict.
3		Line Card	20 Min.	56K
41		BRITE CU1		
42		BRITE CU2		
43		BRITE CU3		
44		BRITE CU4		
45		BRITE CU5		
46		BRITE CU6		

7/Interface Key

This key allows a specific Line Interface to be selected.

If you select item "**7/Interface**" on the keypad, a menu similar to the one below will result:

```
INTERFACE IS 2B1Q
4=EBS 5=POTS
```

For example, the unit setup is currently for the ISDN 2B1Q Interface, and this menu allows the interface configuration to be changed. The "Setup" menus also allow the interface to be selected.

To exit the "7/Interface" menu, press "**Setup**" and "**1**" to accept.

8/Status Key

If you select item "**8/Status**" on the keypad, the following menu will result (for example):

```
CAUSE INFO 16
NORMAL CLEARING
```

This is an information menu which provides diagnostic cause messages. The first line displays the cause value. The second line will display the cause message, which may be one of the following:

1	"UNASSIGNED NUM"	2	"NO ROUTE TO NET"
3	"NO ROUTE TO DEST"	6	"CHN UNACCEPTABLE"
7	"CALL AWARDED"	16	"NORMAL CLEARING"
17	"USER BUSY"	18	"NO USER RESPONSE"
19	"ALERTING NO ANS"	21	"CALL REJECTED"
22	"NUMBER CHANGED"	26	"NON SELECTED CLR"
27	"DEST OUT ORDER"	28	"INVALID NUM FMT"
29	"REQ FACILITY REJ"	30	"RSP TO STAT ENQ"
31	"NORM UNSPEC"	34	"NO CHAN AVAIL"
35	"QUEUED"	38	"NET OUT ORDER"
41	"TEMP FAILURE"	42	"NETWORK CONGEST"
43	"INFO DISCARDED"	44	"CHN NOT AVAIL"
47	"RESOURCE UNAVAIL"	49	"QUAL SVC UNAVAIL"
50	"FAC NOT SUBSCRIB"	52	"OUT CALLS BARRED"
54	"IN CALLS BARRED"	57	"BEARCAP NOT AUTH"
58	"BEARCAP NOT AVAI"	63	"SERVC NOT AVAIL"
65	"BEARSVC NOT IMPL"	66	"CHN TYPE NOT IMPL"
69	"REQ FAC NOT IMPL"	70	"RES DIGITAL ONLY"
79	"SVC NOT IMPLEMNT"	81	"INVAL CALL REF"
82	"CHN NOT EXIST"	83	"NO CALL ID"
84	"CALL ID IN USE"	85	"NO CALL SUSPEND"
86	"CALL CLEARED"	88	"INCOMPAT DEST"

91 "NET NOT EXIST"	95 "INVALID MSG"
96 "INFOELEMENT MISS"	97 "MSG TYPE NONEXST"
98 "MSG NOT COMPAT"	99 "ELEMENT NONEXIST"
100 "INVAL INFO"	102 "RECOV ON TMR EXP"
111 "PROTOCOL ERROR"	127 "INTERWORKING"

NOTE: *The "21 CALL REJECTED" cause message appears when a setup element is wrong, for example, no TID set for NI-1 call control. The "50 FAC NO SUBSCRIB" (facilities not subscribed) cause message will appear if a wrong SPID is used.*

Access to other line status and Model 550A set-up information menus may be gained by pressing the "**Scroll Menu**" key.

```
M CHAN-ACT X DEA X AIB X
NT1 HOLD STATE
```

This is a menu which provides Maintenance Channel information relative to the Activate (ACT) bit, Deactivate (DEA) bit, Alarm Indicator bit (AIB) and actual EOC messages received.

An ACT bit=1 is normal (0 indicates not transparent to network)
A DEA bit=1 is normal (0 Indicates the network is going to deactivate)
An AIB bit=1 is normal (0 Indicates a problem)

The second line displays the EOC message information. The EOC message will be addressed to "NT1" or "BROADCAST". The Actual EOC message received may be one of the following:

"2B+D LOOPBACK"
"B1 LOOPBACK"
"B2 LOOPBACK"
"REQ CRPT CRC"
"NOTIFY CRPT CRC"
"RETURN NORMAL"
"HOLD STATE"
"UNABLE COMPLY ACK" by NT1

This is a menu which provides Layer 1 diagnostic messages relative to the state of the U (Line) Interface.

For the "NT1/TE" Mode, the following information will be shown on the bottom line of the display:

2B1Q Messages which may appear:

"H1 FULL RESET" = Resetting our interface
"H2 ALERTING" = Trying to wake up network
"H6 ISW SYNC" = Sync achieved
"H8 ACTIVE" = Interface ready for use
"H10 TEAR DOWN" = Taking interface down

In the AMI line coding format, a N-channel is present, rather than the M-channel as in the 2B21Q coding format. Layer 1 messages are sent downstream from the network to a NT1 and upstream from a NT1 to the network. The States menu selection will show the messages outlined below, with "D" for downstream and "U" for upstream.

AT&T AMI N-channel (Received) Downstream (D) messages which may appear:

"D 1 NT 2B+D LB" = Loopback 2B+D at NT1
"D 2 NT B1 LB" = Loopback Chan. B1 at NT1
"D 3 NT B2 LB" = Loopback Chan. B2 at NT1
"D 6 ACT MODE/IDLE" = Activated Mode/Idle
"D 8 ACT REQUEST" = Activation Request
"D 15 DEACTIVATED" = Out of Service

AT&T AMI N-Channel (Sent) Upstream (U) messages which may appear:

"U1 AWAKE INDICATION" = Request by TE to activate S/T Interface
"U 6 ACT MODE/IDLE = Idle condition
"U 7 S/T NOT EST" = Lack of sync at S/T Interface
"U 15 DEACTIVATED" = Out of Service

```
L1 : ST INFO
CPE X  NTW X
```

This is a menu which provides layer 1 diagnostic messages relative to the state of the S/T Interface. The second line will display the info states.

The following information will be shown on the display for "TE" and "NT1" modes.

Combinations CPE	Network	Meaning
Info 0	Info 0	Just powered up (less than 1 second) or not working.
Info 1	Info 0	Terminal is waiting for framing from network. Network is down or there is a wiring problem. Line to switch is not operational.
Info 1	Info 2	Network initiating communication with TE.
Info 3	Info 4	Link to network is operational. Terminal should work. If not, there are potential translation problems.

L2 : LAPD STATE TEI UNASSIGNED

This is a menu which provides layer 2 information for link access protocol for the "D" channel. The second line will display the message. The complete messages and their meanings are indicated below:

"TEI UNASSIGNED" = Power up state

"ASSIGN AWAITING TEI" = Requesting TEI state

"ESTABLISH AWAITING TEI" = Requesting TEI state

"TEI ASSIGNED" = TEI has been assigned

"AWAITING ESTABLISHMENT" = Not yet in multiple frame state

"AWAITING RELEASE" = Release request from multiple frame state

"MULTIPLE FRAME ESTABLISHED" = Completed SABME / UA (This is the state the 550A should be in when ready to place a call.)

"TIMER RECOVERY" = Error State

L3 : CALL STATE
ESTABLISH WAIT

This is a menu which provides layer 3 information for the state of actual calls. The second line will display the information. The complete messages and their meanings are indicated below:

"NULL STATE" = No call exists

"CALL INIT" = (Call Initiated) The state exists for an outgoing call.

"OVERLAP SENDING" = Call establishment request acknowledgement has been received permitting additional call information to be sent in the overlap mode.

"OUT CALL PROC" = (Outgoing Call Proceeding)

"CALL DELIVERED" = Remote user alerting has been initiated.

"CALL PRESENT" = State exists for an incoming call.

"CALL RECEIVED" = Incoming call not yet answered.

"CONNECT REQUEST" = Incoming call answered, waiting to be awarded.

"IN CALL PROC" = (Incoming Call Proceeding)

"CALL ACTIVE" = Incoming call or outgoing call state.

"DISCONNECT REQ" = (Disconnect request) Request for network to clear the end-to-end connection.

"DISCONNECT IND" = (Disconnect Indication) Receipt of invitation to disconnect.

"SUSPEND REQUEST" = Request for network to suspend the call.

"RESUME REQUEST" = Request for network to resume a previously suspended call.

"RELEASE REQUEST" = Request for network to release a call.

"OVERLAP RECEIVE" = (Overlap Receiving) Network is prepared to receive additional call information (if any) in overlap mode.

"IDLE STATE" = (Idle Call State) No calls in progress; On hook.

```
SPID IS :
0137505000
```

This menu will display the present SPID number assigned.

```
USID : NONE
TID : NONE
```

This menu will display the User Service Identifier (USID) and Terminal Identifier (TID) codes assigned, if any (TID required for NI-1), after access has been gained.

```
TEI IS AUTO 127
```

This menu will display the current mode (Auto or Fixed) and current assigned Terminal Endpoint Identifier (TEI) number.

```
CLID0 :
1=NEXT ID
```

When an incoming call is received, this menu will display the calling party number on the second line, if the data received contains the calling party number. This menu can store up to 10 CLID messages. Pressing "1" will scroll through the messages.

```
SPM DN XX : XXXXXXXXXX
            3=NEXT DN
```

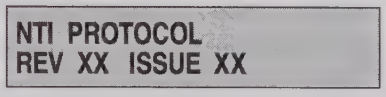
This menu is only valid for NTI-Functional. The above information will be displayed if the switch has SPM (Service Profile Management) information available. This menu can store up to 20 SPM messages. The messages may be reviewed by pressing "3" on the keypad.

```
REDIAL NUMBER :
3750500
```

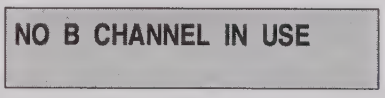
This menu will display the current number available for redial.

This is the only menu available from the "8/Status" key when the unit is configured for "EBS".

When turning up a NTI Functional Call Control circuit, you may wish to verify the correct protocol versions.



The revision and issue numbers of the protocol software for your particular "U" Interface DMS-100 translation will be displayed, if the switch supports this feature (otherwise they will remain blank).



This menu reports which "B" Channel is in use.

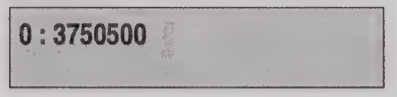
NOTE: *Pressing the "**Scroll Menu**" key allows advancement through the Status menu selections. Pressing the "**2nd Func.**" key then "**Scroll Menu**" allows backward movement through the Status menu selections.*

To exit the "**8/Status**" menu, press "**Setup**" then "**1**" to accept.

9/Store Key

This key allows frequently used numbers to be stored for future speed dial applications.

If you select item "**9/Store**" on the keypad, the following screen will result:



The last number stored in Position "0" will be displayed. If no number has been stored yet in position "0", the display will read "0: ". Up to ten numbers may be stored for future speed dial applications by pressing the "**Scroll Menu**" key.

To store additional numbers, press the "**Scroll Menu**" key to increment the stored number counter.

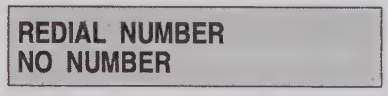
To change a stored number, you may exit and re-enter the "STORE" menu or use the "**Scroll Menu**" key to step past and back to the stored location - at which time the new number may be entered.

An example of a frequently used number you may want to store would be the local BRITL (BRI Dial-Up Test Line) access number.

To exit the "STORE NUMBER" menu, press "**Setup**" then "**1**" to accept.

***/Redial** Key

If you select "***/REDIAL**" on the keypad, the following menu will result:

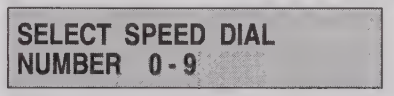


Pressing this key will allow redial of a number that has been entered via the keypad. (Redial cannot be used from the "HOOK" menu, unless you are ON HOOK or you press "**2nd Func.**" first.)

To exit this menu, press "**Setup**" then "**1**" to accept.

0/Speed Dial Key

If you select "**0/Speed Dial**" on the keypad, the following menu will result:



NOTE: *Access to an ISDN line should be made prior to attempting to use the speed dial function.*

Speed dial will not work unless a number has been stored in that location.

To use the Speed Dial function, simply select the single digit number under which your number is stored. The Model 550A will automatically go Off Hook and dial the number.

If Off Hook, the "**2nd Func**." key must be pressed before selecting Speed Dial.

To store a number for Speed Dialing, use the "***/Store**" key.

Redial of the last number may be accomplished by pressing the "***/Redial**" key.

To exit this menu, press "**Setup**" then "**1**" to accept.

#/Utility Key

This menu allows various utility functions to be performed.

If you select "**#/Utility**" on the keypad, the following screen will result:

```
CALL CONTROL = 5ESS
1=DMS-F 2=DMS-S 3=NAT'L
```

The current call control will be displayed. This utility menu allows a call control selection including DMS-S (Northern Telecom-Stimulus). The DMS-S selection is not included in the "Setup" menu selections since it is seldom used.

Pressing the "**Scroll Menu**" key will result in the following menu being displayed:

```
SECOND CALL = ON
1=ON  2=OFF
```

Selecting "Second Call ON" enables the test set to allow a dual call capability. This allows the Model 550A to handle two calls at the same time using both B-channels (B1 and B2).

If the Second Call is ON, pressing the "**Scroll Menu**" key will result in the following menu being displayed (If OFF, Backlight):

```
DUAL TEI = ON
1=ON  2=OFF
```

This menu will only be displayed if the "Second Call" feature is enabled. "ON" would normally be selected unless in a 5ESS Custom or National Point-to-Point setup.

Pressing the "**Scroll Menu**" key again will result in the following menu being displayed:

```
2B1Q MODE =  NT
1=LT MODE      2=NT MODE
```

This menu is used to select "Line Termination" (LT) or "Network Termination" (NT) mode for the 2B1Q Interface; "**NT**" mode is the default setting.

In the "NT" mode, the Model 550A 2B1Q "U" Interface operates as it always has, looking like an NT1 to the switch. However, in the "LT" mode, the Model 550A 2B1Q "U" Interface will act like a Switch Line Card.

The "LT" mode can be used to do Layer 1 qualification of copper facilities. When a Model 550A is in the "LT" mode on one end of a pair of wires, and another Model 550A is in the "NT" mode on the other end, the Model 550As will sync on each other and Layer 1 testing can take place by performing a BERT test on B1 and B2 from each Model 550A to the other, or by checking for CRC and FEBE errors on each set under the "**Results**" menu.

If "**NT MODE**" is selected, the B-Channel menu will display. If "**LT MODE**" is selected, the next menu will be the following:

```
EOC ADDRESS = 0    NT1
1=DOWN           2=UP
```

This menu allows selection of the address (0-7) where the message will be sent.

NOTE: *The NT1 is always address "0". A mid-span repeater, address 1, may also be controlled for loopbacks.*

Press "**Scroll Menu**" to select the message to be sent:

```
MSG : XXXXXXXX
1=PREV  2=NEXT  3=SEND
```

Press the "1" or "2" key to scroll through the messages. To send the message, press "3".

The message may be one of the following:

RETURN TO NORMAL
HOLD STATE
2B+D LOOPBACK
B1 LOOPBACK
B2 LOOPBACK
REQ CORRUPTED CRC
NOTIFY CORRUPTED CRC

Pressing the "**Scroll Menu**" key will result in the following menu being displayed:

```
BACKLIGHT = OFF
1=ON  2=OFF
```

The current backlight status will be displayed.

Pressing "1" will invoke the LCD screen Backlight feature.

NOTE: *Battery life will be enhanced if the LCD Backlighting is turned off when not needed (i.e., when there is sufficient ambient light).*

Pressing the "**Scroll Menu**" key again will result in the following menu being displayed:

```
B CHANNEL = ANY
1=B1  2=B2
```

This menu indicates that the default is either "B" Channel. To choose a channel for outgoing calls, press keypad position "1" or "2". (This is not valid for NTI Stimulus Call Control since it doesn't allow B-Channel selection)

NOTE: *You will be denied if you choose a B channel that the translation of that line doesn't support.*

Pressing the "**Scroll Menu**" key again will result in the following menu being displayed, if the unit is optioned for Data Capability; otherwise, the next menu that will be displayed will be the "VOLUME LEVEL" menu.

```
BEARER CAP VOICE
1=VOICE  2=DATA  3=D PKT
```

This menu allows the user to choose between placing a voice call and setting up a circuit-switched data call or D-Channel Packet Call. The default menu is for voice calls.

Pressing the "**Scroll Menu**" key again will result in the following menu being displayed

```
SPEED 64000
1=56K   2=64K  3=SUBRATE
```

This menu applys only to circuit switched data calls. The default speed is 64000 bits per second rate, however 56000 bps or subrate may also be selected.

A data call may now be placed by using the "**Hook On/Off**" menu, just like a voice call. Dial tone may not be audible, but states will be indicated by LCD message on the second line.

Selection of Item "3" on the "BEARER CAPABILITY" menu mentioned above will allow D-Channel Packet data calls.

Pressing the "**Scroll Menu**" key again will result in the following menu being displayed:

```
1234567890
1234567890  *=BkSp #=A-J
```

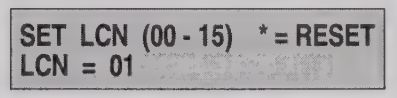
This menu allows input for Call User Data (CUD) when making D-Packet calls; if nothing is entered via this menu, D-Packet Calls are handled in the normal manner.

The telephone number for the D-Packet call should be entered first by dialing the number (using the keypad). A semicolon ";" should then be entered as a separator by pressing the "#" key five times, until the ";" selection becomes available, then selecting the ";" separator by pressing the "0" key. Data that is entered using this method will appear on the display. Following the ";", up to twelve (12) characters of CUD can be entered by using the same procedure as entering the ";". Once the twelve character CUD limit is reached, no more entries are allowed to be made. If a mistake is made the "*" is used to backspace/delete information entered. After entering data, this menu can be exited by pressing "**Scroll Menu**" or "**2nd Func.**" then any key.

After entering data via this menu, going off hook in the D-Packet Mode sends the entire number and CUD automatically. On power down, the CUD information is retained and will be present in the menu the next time it is accessed. It is important to note that if there is stored CUD information, any time a D-Packet call is made the CUD and number will automatically be dialed. To clear the CUD buffer you must be in the CUD menu and press "*" to backspace/delete all numbers and CUD information, then exit the menu.

Packet Data call options may be selected as follows:

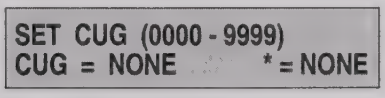
1. Press "**Scroll Menu**" to set the LCN (0-15):



   The Logical Channel Number may be selected in a range of 0-15, with 1 being the default setting if no other selection is made.

NOTE: *The Model 550A uses a LCGN (Logical Channel Group Number) of "0".*

2. Press the "**NEXT**" soft key or "**Scroll Menu**" to select the CUG (0-9999):



   The Closed User Group number may be selected in a range from 0 to 9999. "NONE" is the default setting.

3. Press the "**NEXT**" soft key or "**Scroll Menu**" to select the Reverse Charge option:

```
REVERSE CHARGE IS OFF
1 = ON    2 = OFF
```

   The default setting is "OFF".

4. Press "**Scroll Menu**" to select the RPOA (Registered Private Operating Agency) option:

```
SET RPOA (0000 - 9999)
RPOA = NONE        * = NONE
```

   The RPOA code may be entered at this point. The default setting is "NONE".

NOTE: *The Model 550A supports a window size of "3" and Modulo 8.*

Pressing "**Scroll Menu**" will result in the following menu:

```
VOLUME LEVEL = 7
1=RAISE  2=LOWER
```

This menu indicates that the default "Hands Free" volume setting is "7". The volume level for voice calls may be raised or lowered by pressing keypad selections "1" or "2" (no effect on Handset volume).

Pressing the "**Scroll Menu**" key again will result in the following menu being displayed, if the unit is optioned for Data Capability; otherwise, the next menu will be the "NTI STIM REL#" menu:

```
D CHN MON OFF
1=ON  2=OFF
```

Monitoring of "D" channel packet data is available with remote equipment via a DB-25/RS-232 connector on the front panel (when optioned). To enable the RS-232 "D" packet data monitor function (9600, 8, N, 1, DTE), press keypad selection "1". (If in EBS mode, this menu will read "SIGNAL CHANNEL MONITOR".)

If "D CHN MON" is ON, pressing "**Scroll Menu**" will display the following menu (if OFF, Call Appearance):

```
BAUD RATE  9600
1=RAISE 2=LOWER 3=RESET
```

Press "**1**" to raise or "**2**" to lower the baud rate. Selections are available from 150 to 38400. Pressing "**3**" resets to the default 9600.

Pressing the "**Scroll Menu**" key again will result in the following menu being displayed:

```
CALL APPEARANCE  *=AUTO
(1-254) :  1
```

For 5ESS Custom Call Control:

This menu allows the user to place outgoing calls on button numbers selected, other than 1 which is the default setting. "Auto" may be selected to automatically search for the first call appearance on the line under test.

For DMS-F (Northern Functional) Call Control:

This menu allows a selection for a call appearance. But, a Northern Functional Directory Number may also be needed. This number is entered by pressing the "Setup" key, then scrolling to "ENTER DIR NUMBER". Enter the number and return to the Hook screen to place a call.

For NAT'L (National ISDN) Call Control:

Same as DMS-F except "AUTO" will be replaced with "NONE".

For DMS-S (Northern Stimulus) Call Control:

Press the "**Scroll Menu**" key once again to display the following menu:

```
NTI STIM REL#
(1-64) : 24
```

For NTI Stimulus Call Control, the Release Button Number may have to be selected prior to releasing the call.

This menu reflects the default Release Number of "24" (5209 Meridian set). The Release Number may be set by entering the number on the keypad.

If the Model 550A is optioned for the EBS Interface and the EBS Interface is selected, the following menu will result when the "**Scroll Menu**" key is depressed: (Otherwise, the next menu displayed will be the "LCD CONTRAST" menu):

```
0012 EBS MESSAGES
1=LCD  2=SERIAL  3=CLEAR
```

This menu reports the status of the EBS message buffer and allows output of the messages.

The digits "0012" in this menu indicate that there are a total of 12 EBS messages stored in the EBS message buffer. The EBS message buffer has the capability to store up to 128 message decodes. The second line of the LCD allows selection of displaying an abbreviated message on the LCD, outputing all of the detailed message decodes via the "DATA ACCESS" connector, or Clearing the message buffer by simply pressing the corresponding key.

The following is an example of an abbreviated message decode if the LCD is selected for output:

```
0026 CPE>CO 1D-HKS On
1=UP 2=DOWN 3=RETURN
```

The number "26" represents the sequential message decode number. The "CPE>CO" provides information concerning the direction, in this example the direction is from "CPE" towards the "CO". The next displayed item "1D" is the hexadecimal representation of the message. "HKS On" is an abbreviated message decode stating that the Hook Switch is On Hook. Pressing "1" or "2" on the keypad will scroll through the messages. Pressing "3" will return to the "EBS MESSAGES" display.

Pressing the "**Scroll Menu**" key will display the following menu:

```
ENTER EBS STATION
ADDRESS : X
```

There may be several devices connected to an EBS line at the customer premise. Each device would have its own address in order to communicate with the switch.

There is always a basic set with address "0" that terminates the line, normally at 900Ω. Add-on devices may include speaker phones or 18-button, 20-button, or 36-button add-on modules. Normal add-on addresses would be 1, 2, or 3. The Model 550A can be configured for any address (0-7) and any button number (1-254).

If the Model 550A is optioned for the POTS Interface and the POTS Interface is selected, the following menu will result when the "**Scroll Menu**" key is depressed (Otherwise, the next menu displayed will be the "LCD CONTRAST" menu):

```
POTS MODE  TONE
1=TONE  2=PULSE
```

The current POTS mode will be displayed and may be changed.

Pressing the "**Scroll Menu**" key once again will result in the following menu:

```
LCD CONTRAST = 4
1=RAISE  2=LOWER
```

This menu allows the user to vary the LCD contrast.

Pressing the "**Scroll Menu**" key once again will result in the following menu:

```
B1 LB = OFF
1=ON  2=OFF
```

The current loopback status will be displayed.

This menu and the loopback menus that follow, allow specific loopback actions within the Model 550A.

Pressing the "**Scroll Menu**" key will display the following menu:

```
FLOW CONTROL IS OFF
1=ON    2=OFF
```

This menu will only be displayed if the D-Channel Monitor is ON. Flow control for the D-Monitor port can be selected by selecting "1", which will enable data flow with hardware handshake by CTS pin 5.

Pressing the "**Scroll Menu**" key once again will result in the following menu:

```
TEI IS AUTO 127
 1=AUTO  2=FIXED
```

The current TEI status will be displayed. To change, select "1" or "2".

NOTE: *Pressing the* "**Scroll Menu**" *key allows advancement through the Utility menu selections. Pressing the* "**2nd Func.**" *key then* "**Scroll Menu**" *allows backward movement through the Utility Menu selections.*

Pressing the "**Scroll Menu**" key once again will result in the following menu:

```
AUTO POWER DOWN IS XXX
 1=ON    2=OFF
```

This menu allows control over the power down feature of the unit. The Auto Power Down feature enables the set to turn itself off, to conserve battery life, if there is no activity for five (5) minutes in ISDN mode or ten (10) minutes in EBS/POTS modes. This menu is not applicable if the AC adapter is used.

To disable the Automatic Power Down feature of the unit, press "2". The unit will then stay powered until the battery runs down.

Pressing the "**Scroll Menu**" key once again will result in the following menu:

```
2B1Q 40kHz TONE  OFF
1=ON   2=OFF
```

Press "1" on the keypad to generate a 40kHz tone, at approx. +14dBm, in 2B1Q NT1/TE or 2B1Q NT1. The "U" Loss pads may be used to pad this signal down to 0dBm, if desired.

Pressing the "**Scroll Menu**" key once again will result in the following menu:

```
TPI 550A Ver X.XX   Cfg. 3
 2B1Q          EBS  POTS
```

This menu reports the firmware version and the options installed. If an option is not installed, it will not appear.

Pressing the "**Scroll Menu**" key once again will result in the following menu:

```
BATTERY 12.58V   CHARGED
************************
```

This menu reports the battery status and voltage level. The bottom line is a bar graph of the battery level.

Pressing "**Scroll Menu**" will return to the first menu (Call Control).

To exit the "**#/Utility**" menu, press "**Setup**" then "**1**" to accept.

Hook On/Off Key

If you select item "**Hook On/Off**" on the keypad, the following screen will be shown:

```
WAITING RESPONSE
IDLE
```

The first line represents the Model 550A status. The second line represents the line state.

The Model 550A will pause to communicate with the switch. You will then hear the dial tone, and the "STATE" will change to "DIAL TONE" and the following menu will result:

```
ENTER NO.
DIAL TONE
```

The number may now be entered from the keypad. When the number has been entered, the following menu will result, after passing quickly through the "DIALING" and "RINGBACK" states:

```
3750500
CONNECT B1
```

"B1" reflects the current B-channel. "3750500" reflects a number that was entered.

This menu reflects a successful connection and conversation may take place utilizing an external handset connected or the handsfree feature provided by the Model 550A.

The normal sequence followed by the ISDN 550A Basic Rate Test Set when making a voice call will be as indicated below:

1 - IDLE
2 - DIAL TONE
3 - DIALING
4 - CONNECT
5 - RELEASING
6 - IDLE

An incoming call will sound a beep. To answer, press the "**Hook On/Off**" key. Conversation may now take place. To hang up, press the "**Hook On/Off**" key again.

NOTE: *During a call, if the other end terminates a call, the Model 550A will automatically go to "On Hook" status.*

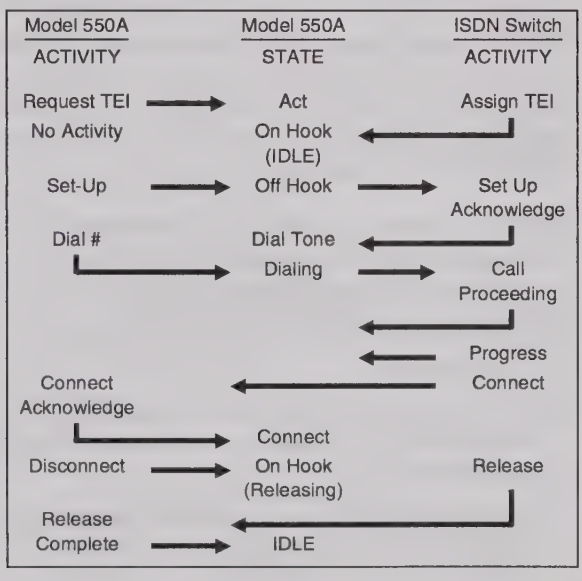
The Model 550A will display the normal call sequence messages listed earlier to indicate call status, along with other status messages such as "Denied", "Connect", "Ringback", and "Ringing". The meaning of these messages is reviewed below:

IDLE	-	Hung up.
DIAL TONE	-	The switch has sent a message saying we have a dial tone.
DIALING	-	In the process of dialing digits as entered.
RELEASING	-	Sent the disconnect message to the switch.
DENIED	-	Have been denied service by the switch, e.g. channel requested is not available, or SPID requested is invalid.
CONNECT	-	Received message from switch that call has been put through.

RINGBACK - Placed a call and the switch is ringing the other end, which has not yet answered.

RINGING - Receiving an incoming call (go OFF HOOK to answer).

The following table also illustrates a typical call control sequence where the TPI 550A originates a call on an ISDN switch:



Once the voice call has been completed, press the "**Hook On/Off**" key which will leave you in the "HOOK" menu, or you may return to the menu's without hanging up by pressing the "**2nd Func.**", then the desired key.

HOW TO MAKE A VOICE CALL

*A SPID (Service Profile Identifier) will normally have to be entered via the "**Setup**" menu or key "**5/SPID**" (or the call will be denied).*

The **switch type must be selected**, *and the "***TEI***" (Terminal Endpoint Identifier) may need to be* **set via the "Setup" menu**.

ISDN Switches may take up to a minute to initialize *when access is gained and/or when a mode change takes place. If the "***Hook On/Off***" key is pressed during this initialization period, a "WAITING FOR RESPONSE" message may be displayed.*

1) GO OFF HOOK by pressing the "**Hook On/Off**" keypad button (will hear dial tone).
2) ENTER THE NUMBER using the keypad (LCD screen will display number entered and channel selected).
3) CONVERSATION may now take place using the "**Hands Free**" feature (an external handset may also be connected).

   TO END a Voice Call, go On Hook by pressing the "Hook On/Off" keypad button.

TROUBLESHOOTING TIPS

1) For **most circuits**, the **"SPID" must be entered** prior to going off hook (use **"5/SPID"** keypad selection to check the SPID).

2) **"TEI" assignment** must have been made before a dial tone can be heard (check for the "**Ready**" LED or use the **"Status"** menu to verify Layer 2 state).

If TEI assigned, LCD lower line = "MULTI FRAME EST"
If TEI is *not* assigned, lower line = "TEI UNASSIGNED"

3) If dial tone has not been gained, or if the LCD screen displays a "DENIED" message, use the "**Status**" menu to check the CAUSE INFO, which will give a diagnostic cause message.

4) If set-up needs to be checked, press the "**Setup**" keypad button, which will prompt the operator to answer several setup related questions that will configure the Model 550A to the circuit and switch being accessed.

SECOND CALL Feature:

If the "Second Call" feature is ON (Utility sub-menus), then two calls, using both B-channels, may be processed. Two calls may be active. The handset and/or speaker phone can access one at a time. Pressing the "Scroll Menu" key will move between the two active calls.

The "Hook" screen will show "PH #1" or "PH #2" in the upper right-hand corner as applicable.

See Section 2.6 for more information on Dual Calls.

HOW TO MAKE A DATA CALL

*A SPID (Service Profile Identifier) will normally have to be entered via the "**Setup**" menu or key "**5/SPID**" (or the call will be denied).*

The **switch type must be selected**, *and the* "**TEI**" *(Terminal Endpoint Identifier) may need to be* **set via the "Setup" menu**.

ISDN Switches may take up to a minute to initialize *when access is gained and/or when a mode change takes place. If the* "**Hook On/Off**" *key is pressed during this initialization period, a "WAITING FOR RESPONSE" message may be displayed.*

If the Model 550A is optioned for data capability, the "UTILITY" menu will allow the user to choose between placing a voice call, and setting up a Circuit-Switched Data call or D-Channel Packet Data call.

For Circuit-Switched Data calls, the "UTILITY" menu gives the user access to three types of calls, relating to choices for service and speed:

1) 56000 BPS Unrestricted
2) 64000 BPS Unrestricted
3) Subrate Restricted (5ESS only)

Once the "UTILITY" menu has been used to select "Data", service type and speed, a Circuit-Switched Data call may now be placed by using the "**Hook On/Off**" menu, just like a Voice call.

1) Press the "**#/Utility**" keypad button.
2) Press the "**Scroll Menu**" keypad button until the "BEARER CAPABILITY" sub-menu is gained.
3) Select "2=**DATA**".
4) A Circuit Switched Data Call may now be placed, just like a voice call.
   A - GO OFF HOOK, by pressing the "**Hook On/Off**" keypad button (may hear dial tone).
   B - ENTER THE NUMBER, using the keypad (LCD screen will display number entered and channel connected to).
5) BERT testing may now take place.
   A - Press "**2nd Func.**" followed by "**BERT**"
   B - Make sure the Speed and B-Channel are correct.
   - The B-Channel should be the B-Channel shown when the call was connected.
   - The Speed should be 64K for Clear Channel Testing and 56K for Non-Clear.
   C- Start the BER Test by pressing "1=**STRT/CLR**". There will be a burst of bit errors (BE).
   D - Press "1=**STRT/CLR**" again to clear the initial errors. Press "3=6ERR" to insert 6 bit errors into the transmit pattern.
   E - Run the test for a desired amount of time and determine if total errors is acceptable (see your company policy).
   F - Press "2=**STOP**" to end the test.

TO END a Data Call, go On Hook by pressing the "**Hook On/Off**" keypad button.

TROUBLESHOOTING TIPS

1) It is best to verify that a Voice Call can be made successfully, prior to attempting a Data Call.

2) For **most circuits**, the **"SPID" must be entered** prior to going off hook (use **"5/SPID"** keypad selection to check the SPID).

3) **"TEI" assignment** must have been made before a dial tone can be heard (check for the "**Ready**" LED or use the **"Status"** menu to verify Layer 2 state).

If TEI assigned, LCD lower line = "MULTI FRAME EST"
If TEI is *not* assigned, lower line = "TEI UNASSIGNED"

4) If dial tone has not been gained, or if the LCD screen displays a "DENIED" message, use the "**Status**" menu to check the CAUSE INFO, which will give a diagnostic cause message.

5) If set-up needs to be checked, press the "**Setup**" keypad button, which will prompt the operator to answer several setup related questions that will configure the Model 550A to the circuit and switch being accessed.

HOW TO MAKE A D-CHANNEL PACKET DATA CALL

*A SPID (Service Profile Identifier) will normally have to be entered via the "**Setup**" menu or key "**5/SPID**" (or the call will be denied).*

The **switch type must be selected**, *and the "**TEI**" (Terminal Endpoint Identifier) may need to be* **set via the "Setup" menu**.

ISDN Switches may take up to a minute to initialize *when access is gained and/or when a mode change takes place. If the "**Hook On/Off**" key is pressed during this initialization period, a "WAITING FOR RESPONSE" message may be displayed.*

1) Press the "**#/Utility**" keypad button.
2) Press the "**Scroll Menu**" keypad button until the "BEARER CAPABILITY" sub-menu is gained.
   - Select "3=D-PKT".
3) Press the "**Hook On/Off**" keypad button (the lower LCD display line will indicate "READY FOR CALL").
4) ENTER THE NUMBER using the keypad.
5) Press the "**#/Utility**" keypad button to send the call (lower LCD line="CONNECT_D").
6) Press the "**1/Results**" keypad button to send the following message over the D-Channel "01:The red fox jumped over the lazy dog". Each time the "**1/Results**" key is pressed, the message will be sent with the preceeding number incrementing with each key press. Press "**2/Auto**" to clear the message.
7) The Model 550A will display any information coming to it on the LCD screen.

TO END a D-Channel Packet Data Call, go On Hook by pressing the "**Hook On/Off**" keypad button.

TROUBLESHOOTING TIPS

1) It is best to verify that a Voice Call can be made, prior to attempting a D-PKT Call.
2) For **most circuits**, the **"SPID" must be entered** prior to going off hook (use **"5/SPID"** keypad selection to check the SPID).
3) **"TEI" assignment** must have been made before a dial tone can be heard (check for the "**Ready**" LED or use the **"Status"** menu to verify Layer 2 state).

If TEI assigned, LCD lower line = "MULTI FRAME EST"
If TEI is *not* assigned, lower line = "TEI UNASSIGNED"

4) If dial tone has not been gained, or if the LCD screen displays a "DENIED" message, use the "**Status**" menu to check the CAUSE INFO, which will give a diagnostic cause message.
5) If set-up needs to be checked, press the "**Setup**" keypad button, which will prompt the operator to answer several setup related questions that will configure the Model 550A to the circuit and switch being accessed.
6) If the lower LCD status line doesn't indicate "**READY FOR CALL**" when the "**Hook On/Off**" button is pressed, the X.25 link hasn't been made.
7) If the lower LCD status line doesn't indicate "**CONNECT_D**" when the "**#/Utility**" keypad button is pressed to send the call, the call was not successful.
8) If you've dialed into an echo line, this message will be displayed on the Model 550A LCD. If you've dialed into a packet gateway, the Model 550A will display a gateway access message on the LCD.

Setup Key

If you select item "**Setup**" on the keypad, a menu will be displayed that reflects the current setup configuration. For example:

```
ISDN NT1TE 2B1Q 5ESS PP
1=ACCEPT 2=CHANGE
```

This menu indicates the unit is configured for ISDN service, in the NT1TE mode, with a 2B1Q Interface, 5ESS call control, and point-to-point configuration.

To accept the above setup configuration, select "1". If the setup needs to be changed, selection of "2" will enable the "**EASY-USER-MODE**" for setup. An LCD prompting routine will lead step-by-step to insure correct setup (see Section 2.2).

1.2.4 CABLES AND ACCESSORIES

The Model 550A ISDN Basic Rate Test Set comes equipped with the following cables and accessories:

PART #	DESCRIPTION
TPI 550A-1A (TPI 835835)	8-Pin Mod to 6-Pin Mod Cable
TPI 550A-2 (TPI 834005)	8-Pin Mod to 8-Pin Mod Cable
TPI 550A-3L (TPI 836175)	8-Pin Mod to Alligator Clips Cable
TPI 550A-4 (TPI 825400)	Battery Charger/AC Adapter ("POWER/CHARGE" Jack) [12VDC, 350mA]
TPI 550A-22	National ISDN 1 Call Control

The Model 550A ISDN Basic Rate Test Set has several optional features and accessories which may be ordered:

PART #	DESCRIPTION
TPI 550A-3 (TPI 834008)	8-Pin Mod to 4-Clip Leads Cable (HD)
TPI 550A-6 (TPI 834045)	8-Pin Mod to Heat Coil Connector Cable (HD)
TPI 550A-7 (TPI 837190)	Soft Pack Carry Case
TPI 550A-8 (TPI 835090)	Hand Set (Telephone w/Cord & 4-Pin modular plug to make a voice call. Plugs into "HAND SET" connector on front panel.

.TPI 550A-15 (TPI 835027)	2B1Q Interface
TPI 550A-16 (TPI 835065)	Data Capability (For monitoring of "D" channel packets, setup of Circuit Switched Data Calls, setup of Packet Data Calls, and Bit Error Testing.)
TPI 550A-17 (TPI 835075)	8-Pin Modular to Bantam Cable
TPI 550A-18 (TPI 835080)	8-Pin Modular to Twin Bantams
TPI 550A-19 (TPI 835085)	Craft Access Adapter
TPI 550A-23 (TPI 835031)	EBS/POTS Interface
TPI 550A-26	Dual B-Channel Capability
TPI 550A-27	B-Packet Capability
TPI 550A-HVT (TPI 835094)	High Voltage Termination Module

NOTE: *The AMI option is no longer available.*

1.3 MAINTENANCE

The only replaceable parts on the ISDN Basic Rate Test Set are the external cords. The LED indicators and displays are soldered into the unit and are not field replaceable.

If the Model 550A operation should become suspect, the unit may be checked for proper operation by performing a SELF TEST. This is done by turning the power off then on again, which will initiate a Power-Up Self Test. If this procedure does not operate successfully, contact the factory Customer Service department at 540-375-0500.

1.3.1 CALIBRATION

Calibration is not required for the Model 550A, due to the Digital nature of its design, and due to the synchronous nature of the derived timing from ISDN networks. If proper operation of the ISDN Portable Test Set is in question, the Power-Up Self Test mentioned above may be performed.

1.3.2 EPROM MODULE

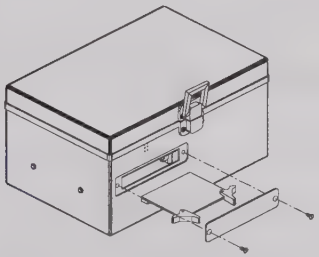
The Model 550A houses a removable firmware EPROM module, located on the right side of the unit which can be upgraded in the field. Replacement is accomplished through the following steps:

1. Turn the Power switch OFF and unplug the AC Adapter, if used.

2. With a static discharge wrist strap on, remove the (2) screws from the EPROM ACCESS cover on the left side of the unit, which will release the cover.

3. Push the corner tabs of the EPROM module toward the outside to release the module. Gently pull out the EPROM circuit board.

4. Insert the new board assembly as shown below and firmly press the board into place to secure it.



5. Re-assemble the EPROM ACCESS cover.

6. Power up the Model 550A.

7. Depress and hold the "*/Redial" key and power up the Model 550A.

8. Recycle power and verify that a) the "Reset System Defaults" message appears and b) the SELF TEST passes.

9. Return the replaced EPROM module(s) to TPI Customer Service, with the unit serial number noted.

1.4 SPECIFICATIONS

PHYSICAL

LINE INTERFACES (OPTIONAL)

2B1Q
EBS (P-Phone)
POTS

S/T INTERFACE (Standard)

POWER

Internal 12V Lead Acid Rechargeable Battery

Battery Charger/AC Adapter

Battery Recharge Time = 12 to 14 hours

WEIGHT

3½ to 4½ pounds (dependent upon Interfaces optioned)

DIMENSIONS

4¼" deep, 5½" wide, 8½" long

OPERATIONAL

TE MODE

Compatible with AT&T 5ESS Switches

Compatible with NTI DMS-100 switches

NT1 MODE

2B1Q DSL per ANSI T1.601 (1988)

AT&T AMI DSL per AT&T 5D5-900-311

"S/T" INTERFACE

per ANSI T1.605 (1989)

"DATA ACCESS" CONNECTOR: DB25/RS232

9600 baud
8 data bits
1 stop bit
No parity
Use "Null" cable or "Turnover" cable
(TPI 550A-25)

ATTENUATION:

LINE = 0-15dB, 1dB Steps

S/T = 0-7dB, 1dB Steps

26 AWG Cable Simulators

MEASUREMENTS

TEST RESULTS

2B1Q

CRC Errors & Errored Seconds

FEBE Errors & Errored Seconds

AMI

FRAME Errors & Errored Seconds

S/T

FRAME Errors & Errored Seconds

BPV Errors & Errored Seconds

TEI

Terminal Endpoint Identifier (AUTO/FIXED)

SPID

Service Profile Identifier (ENTER/STORE)

CALL STATUS

Displayed on LCD

TEST INTERVAL

1 Minute to 99 Hours

LED INDICATORS

OFF HOOK - Indicates that the Model 550A is in a call state

STATUS

"U" Sync - Indicates DSL is Framed (Framing Pattern)

"U" Active - Indicates DSL is Activated (Act bit is set to network)

"U" Ready - Indicates the DSL is Ready

"U" Error - Indicates that Error has been detected on DSL

2B1Q - CRC OR FEBE

ATT AMI - FRAME Error or FEBE

NTI AMI - BPV Error

"S/T" Sync - Indicates S/T is Framed (Framing Pattern)

"S/T" Active - Indicates S/T is Activated (Interface has achieved INFO 3 & 4)

"S/T" Ready - Indicates the S/T is Ready

"S/T" Error - Indicates that Frame or BPV Error has been detected on S/T Interface

B1 LpBk - Indicates Manual or Remote Loopback on B1 Channel

B2 LpBk - Indicates Manual or Remote Loopback on B2 Channel

2B+D LpBk - Indicates Manual or Remote Loopback on the entire 2B+D Bandwidth

Test Mode - Remote Loopback Test/Command

LINE INTERFACE

2B1Q - Indicates 2B1Q Line Format selected for operation

AMI - Indicates AT&T AMI Line Format selected for operation (older units only)

EBS - Indicates the Electronic Business Set (P-Phone) Interface has been selected for operation

POTS - Indicates the POTS Interface has been selected for operation

Sealing Current - Indicates that Sealing Current is present on the DSL
(2B1Q - GREEN indicates Sealing Current)
(AT&T AMI - GREEN indicates Correct Polarity)

S/T INTERFACE

PS1 - Indicates that Power Source1 is present and over 30 volts
(GREEN indicates Correct Polarity/
RED indicates Reversed Polarity)

PS2 - Indicates that Power Source 2 is present and over 30 volts
(GREEN indicates Correct Polarity/
RED indicates Reversed Polarity)

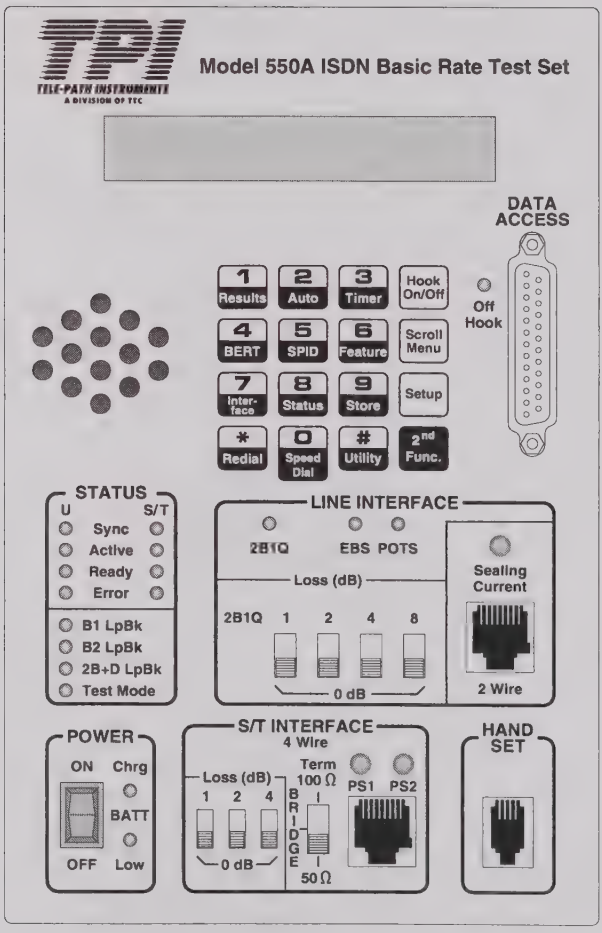
POWER

BATT Chrg - Indicates the internal battery is being charged. Will light when the AC Adapter is plugged in.

BATT Low - Indicates a Battery Low condition, with a maximum of ten minutes of operating time remaining before complete shutdown.

SECTION II

OPERATION


TPI
TELE-PATH INSTRUMENTS
A DIVISION OF TTC
Model 550A ISDN Basic Rate Test Set
DATA ACCESS
1 Results
2 Auto
3 Timer
Hook On/Off
Off Hook
4 BERT
5 SPID
6 Feature
Scroll Menu
7 Inter-face
8 Status
9 Store
Setup
* Redial
0 Speed Dial
Utility
2nd Func.
STATUS
U
S/T
Sync
Active
Ready
Error
B1 LpBk
B2 LpBk
2B+D LpBk
Test Mode
LINE INTERFACE
2B1Q
EBS
POTS
Loss (dB)
2B1Q 1 2 4 8
0 dB
Sealing Current
2 Wire
POWER
ON
Chrg
BATT
OFF
Low
S/T INTERFACE
4 Wire
Loss (dB)
1 2 4
0 dB
Term
100 Ω
BRIDGE
50 Ω
PS1
PS2
HAND SET

2.1 POWER UP

Press the "POWER" switch. This will turn the ISDN Portable Test Set on, and will start the five second Self Test routine. The LCD screen will flash (with all pixels turned on), then clear, and all LED's will light, then extinguish.

When the self test has concluded, a message will appear on the LCD screen (briefly) with the current firmware version and a message reporting the results of the Self Test.

The MODE selector LED's will report the last operating mode used.

The LINE INTERFACE LED's will report the last interface used (provided that the "S/T" Interface was not the last interface used).

The STATUS **Error** Led(s) will illuminate for the selected interface until access is gained to a circuit.

NOTE: *If the power up self test should fail, please contact TELE-PATH INSTRUMENTS at 221 S. Yorkshire St., Salem, VA 24153, phone (540) 375-0500, fax (540) 375-0505.*

2.2 SETUP

At the conclusion of the Self Test routine, the LCD will report the last setup used. For example, the following menu would result at the conclusion of the Self Test routine if the last setup application was ISDN, the mode was NT1/TE, the call control was 2B1Q, the switch was 5ESS, and a Point-to-Point line was used.

```
ISDN NT1TE 2B1Q 5ESS PP
1=ACCEPT   2=CHANGE
```

This power up menu prompts the user to consider the setup for the current application, prior to taking any other action. If the last setup reported is correct, the setup may be accepted, or other menus may be selected:

1) Pressing the "**1/Results**" key will accept the current setup and default to the HOOK menu.

2) Should this last setup need to be changed, press the "**2/Auto**" key and the **EASY-USER-MODE** will walk the user through the entire setup routine.

3) Pressing the "**2nd Func.**" key, then the "**2/Auto**" key will enter the U INTERFACE AUTO CONFIGURATION menu.

4) Pressing any other key will result in access to the menu indicated.

If the setup needs to be changed, press the "**2/Auto**" key. The following menu will result:

```
ISDN NT1TE 2B1Q 5ESS PP
1=ISDN 2=EBS 3=POTS
```

This menu selects the service mode (also available on the "**7/Interface**" key) which includes POTS and EBS (P-Phone), if optioned.

If "POTS" is selected, setup is complete.

See section 2.6 for EBS Setup.

If "ISDN" is selected, the following menu will result:

```
ISDN NT1TE 2B1Q 5ESS PP
1=NT1 2=TE 3=NT1TE
```

This menu selects the mode of operation. If you wish to replace a NT1, select the "1". If you wish to replace a "TE", press the "2" key. If you wish to replace both the NT1 and TE, select "3".

If "NT1" is selected, the following menu will result:

```
ISDN NT1  2B1Q
1=2B1Q 2=AMI
```

This menu selects the interface (also available on the "**7/Interface**" key). After this selection is made, this particular setup is complete.

If "TE" is selected from the mode menu, the following menu will be displayed:

```
ISDN TE              5ESS PP
1=5ESS 2=DMS-F 3=NAT'L
```

This menu selects the call control (also available through the "**#/Utility**" menus). The choises are: 5ESS, DMS-Functional, and optional National ISDN.

If "5ESS" is selected, the following menu will result:

```
CONFIG IS POINT TO POINT
1=PT TO PT 2=MULTI POINT
```

If "Point to Point" is selected, setup for this configuration is complete.

If "Multi Point" is selected from this menu or if "DMS-F" or "NAT'L" is selected from the TE *Call Control* menu, the "ENTER SPID" menu will appear:

```
ENTER SPID           #=SEND
XXXXXXXXXX
```

At present, for 5ESS, the SPID is formed by preceding the phone number by "01" and adding a "0" to the end (0137505000).

For NTI Functional (DMS-F), the SPID is the 10-digit primary directory number plus an optional two-digit SPID suffix. (For example, "5403750500 00.)

The Terminal ID (***TID***) is required for National translations and is ***entered as part of the SPID***. The TID is a two-digit number from 00 - 62. For example, for 5ESS, "01375050011" would be the SPID for the number above, after adding "11" as the TID. Nor NTIF, the SPID would be "54037505000011".)

Pressing "**Scroll Menu**" will result in the following menu:

```
ENTER DIRECTORY NUMBER
DN : X
```

After the DN has been entered, a menu will prompt to set the TEI:

```
TEI IS AUTO 64
1=AUTO 2=FIXED
```

If "AUTO" is selected, setup for this configuration is complete.

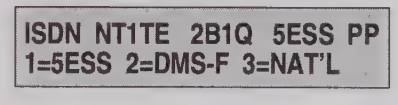
If "FIXED" is selected, a menu will prompt to "SET TEI". After setting the TEI, setup for this configuration is complete.

If "NT1/TE" is selected from the ***Mode*** menu, the following menu will result:

```
ISDN NT1TE 2B1Q 5ESS PP
1=2B1Q
```

This menu selects the interface (also available on the "**7/Interface**" key).

Once the interface has been selected, the following menu will be displayed:



This menu selects the call control.

If "5ESS" is selected, the configuration (Point to Point or Multi Point) will need to be set. After the configuration is selected, setup is complete for this configuration.

If "DMS-F" is selected, the SPID and TEI will need to be entered. When these have been entered, setup is complete for this configuration.

If "NAT'L" is selected the SPID, TID, DN, and TEI will need to be entered. When this has been done, setup is complete for this configuration.

Pressing "**1/Results**" to accept your setup will display the HOOK menu:

Testing may now take place.

2.3 PRE-QUALIFYING CABLE PAIRS

Pre-qualification of cable pairs is becoming more popular, so that cable construction people can have confidence that the copper plant will handle the service being planned for deployment, prior to the Central Office and Customer Premise equipment being connected.

The Model 550A can be used at the Customer Premise in conjunction with another Model 550A at the Central Office to pre-qualify a Basic Rate Interface (BRI) cable pair.

The following procedures are recommended for pre-qualification:

1) Gain access to the cable pair under test using the **LINE INTERFACE** jack on both units.

2) Setup the Model 550A's for the line under test.
   - The Customer Premise 550A should be in NT1TE mode.
   - The Central Office 550A should be in **LT mode** ("Utility" menus).
   - The "Sync" and "Active" LED's should light on both.

NOTE: *The "Sealing Current" LED will not be lit, nor will the "Ready" LED be lit on either 550A. No calls can be placed, but the line can be qualified by testing B1 and B2, and checking for CRC and FEBE errors.*

3) B1 and B2 can be tested by performing a BER test in either a straightaway fashion, or by using the Central Office 550A to configure a loopback in the Customer Premise 550A and BERT to that loopback.

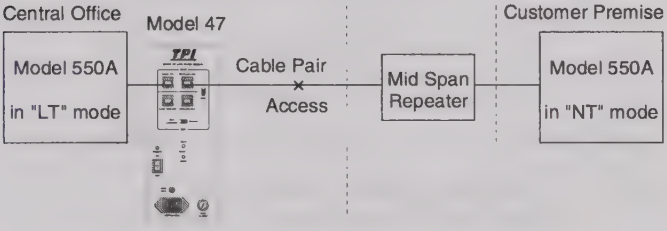
LOOPBACK FROM THE CENTRAL OFFICE:

1) On the Central Office 550A, press the "**Utility**" key.
2) Press "**Scroll Menu**" until the U INTERFACE menu is displayed.
3) Press "**1**" to select "Line Termination" (**LT**) mode.
4) Press "**Scroll Menu**" to gain the EOC ADDRESS menu. Verify that **Address 0** is selected. Press "**Scroll Menu**" to gain the MESSAGE (**MSG**) menu. Press "**2**" until "2B+D LOOPBACK" is displayed. Press "**3**" to send the message.
5) Press the "**2nd Func.**" key then the "**BERT**" key.
6) Press the "**Scroll Menu**" key then "**1**" for channel "**B1**".
7) Press the "**Scroll Menu**" key then "**2**" for "**64K**" data rate.
8) Testing will begin when you press "**1=STRT/CLR**".
9) Press "**1=STRT/CLR**" again to clear any errors. The Bit Errors (BE) and Errored Seconds (ES) should stop counting.
10) Run the test for the desired turn-up time and monitor results for acceptable error performance.
11) Testing will terminate (counters will lock up) when you press "2" to "**STOP**".

Testing B2 may be performed in a similar fashion.

REPEATERED LINE:

For a line with a 2B1Q Repeater, the repeater must be powered in order for the whole loop to be tested. The Model 47 Line Power Module may be used for this purpose. The diagram below shows the connections when using the Model 47.



The switches on the Model 47 should be set to **2B1Q** and **Normal**. Connect the Model 47 **Model 546** jack to the **LINE INTERFACE** jack on the Central Office 550A. The **2B1Q Line Out** jack connects to the line under test.

Once the connections are made, the Model 47 will power the repeater and testing between the Model 550A's can proceed, as described earlier.

2.3 TESTING AT THE "U" INTERFACE

2.3.1 Setup = Use "**Setup**" key for **EASY-USER-MODE**
[Service Mode = ISDN]
[ISDN Mode = NT1/TE]
[Interface = 2B1Q]
[Call Control = 5ESS, DMS-F, or Nat'l]

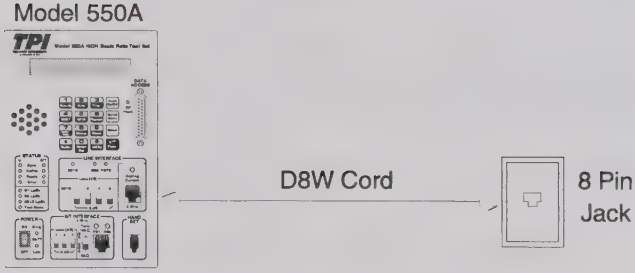
2.3.2 Connection = Use **LINE INTERFACE** Jack

2.3.3 Place A Call = Use "**Hook On/Off**" key

2.3.4 Errored Second Testing = Use "**1/Results**" key

2.3.5 Network Originated Loopback Testing
STATUS LED's will indicate Loopback status

2.3.6 BERT TESTING = Use "**4/BERT**" KEY



Replacing an "NT1" and telephone with the Model 550A.

2.4 TESTING AT THE "S/T" INTERFACE

2.4.1 Setup = Use "**Setup**" key for **EASY-USER-MODE**
[Service Mode = ISDN]
[ISDN Mode = TE]
[Interface = 5ESS, DMS-F, or Nat'l]

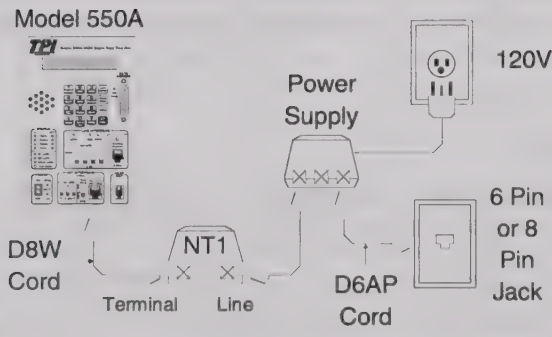
2.4.2 Connection = Use **S/T INTERFACE** Jack

2.4.3 Place A Call = Use "**Hook On/Off**" key

2.4.4 Errored Second Testing = Use "**1/Results**" key

2.4.5 Network Originated Loopback Testing
STATUS LED's will indicate Loopback status

2.4.6 BERT TESTING = Use "**4/BERT**" KEY



Replacing a "TE" with the Model 550A

2.5 DUAL CALL CAPABILITY

2.5.1 OVERVIEW

The Dual Call fearure enhancement for the Model 550A allows two outgoing Circuit Switched Data calls to be in progress at the same time, which verifies that both "B" channels can be used simultaneously.

Although it will work for Voice, the Dual Call feature is intended for Simultaneous Data Calls, in order to simulate what happens when a Video Terminal Adapter sets up a call on each B-Channel and combines the bandwidth, in order to transfer Video information at 112 Kbps or 128 Kbps.

The Dual Call feature was designed as an enhancement for the 550A-16 Data Capability option, and can be provided as a Firmware Upgrade for the Model 550A ISDN Portable Test Set. EPROM Firmware modules can be mailed, on request to holders of Model 550As that were purchased with the 550A-16 Data Capability option.

2.5.2 DETAILS

1) Setup

- Set up the Model 550A as normally done prior to connecting to the line under test (e.g., SPID, Call Control, etc.).
- Connect the Line-under-test , and wait for SYNC, ACTIVE, and READY indications as you would for a normal setup.

- Press the "**Utility**" key.
- Press the "**Scroll Menu**" key for the "SECOND CALL" menu.
- Press the "**1**" key (for "ON") to enable the Dual Call Mode.

NOTE: *If the Line-under-test is 5ESS Point-to-Point (single SPID or no SPID), press the "**Scroll Menu**" key again to access the Dual TEI Mode menu. ("ON" is typically used. Press the "**2**" key, for "OFF", to disable Dual TEI Mode)*

- Press the "**Setup**" key then the "**1**" key (to accept) to return to the HOOK screen.

2) SPID

- Press the "**5/SPID**" soft key to verify SPID #1 is correct. If correct, press the "**Scroll Menu**" key to enter SPID #2 (not needed for 5ESS Point-to-Point)
- Press the "**Setup**" key then the "**1**" key (to accept) to return to the HOOK screen.

3) SPEED

- Press the "**Utility**" key, then "**Scroll Menu**" to access the "BEARER CAP" menu.
- Select the "**2**" key (for "DATA"), then press the "**Scroll Menu**" key to set the Speed to "**64K**", if desired.
- Press the "**Setup**" key then the "**1**" key (to accept) to return to the HOOK screen.

4) OPERATION

- When the Dual Call Mode has been enabled, "PH #1" will appear in the upper right corner of the HOOK screen.
- Press the "**Scroll Menu**" key and "PH #2" will appear. (In this manner, the screen and keypad are coordinated to operate one call versus another.)
- Calls may now be placed on either or both B-Channels using the Dual Call mode. All call control menus are still valid. (e.g., Call Appearance, B-Channel selection, and Bearer capability for each "Phone")

NOTE: *The first time "**Scroll Menu**" is used to access the "PH #2" Hook screen, the Model 550A will request a 2nd TEI from the CO (if Dual TEI mode is enabled), and initialize with the second SPID . This may require 20 to 30 seconds to take place, and going OFF HOOK before this time on "PH #2" will only cause confusion.*

5) TYPICAL TEST SCENARIO

Initiate a Call on "PH #1"

- Go OFF HOOK on "PH #1"
  make sure that the message "Dial tone" appears on the Hook Screen (on 5ESS Switches, no Dial tone will be heard).

Initiate a Call on "PH #2"

- Depress "**Scroll Menu**" to select "PH #2".
- Go OFF HOOK on "PH #2"
- If the "Dial Tone" message appears on the Hook Screen, the translations are correct (max B-Channel) for Simultaneous Data calls

Clear the calls

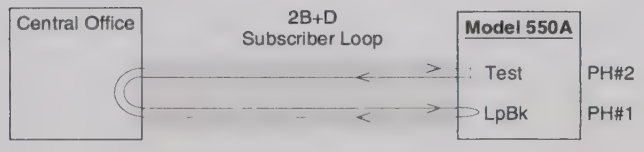
- Go back ON HOOK for "PH #2"
- Depress "**Scroll Menu**" to select "PH #1"
- Go ON HOOK.
- The above Scenario is all that is necessary to test for Simultaneous B-Channel operation.

6) ADDITIONAL TEST SCENARIO

- Should further verification be needed, the following additional test may be performed:
- Place a call to a 108-type test line from "PH #1"
- "**Scroll Menu**" and place a call to the same test line from "PH #2".
- BERT "B1" or "B2"

LOOPBACK:

- With each B-channel having a dialable number, turn the "Second Call" feature ON in the "**Utility**" menus, press "**Hook On/Off**" to go to the ON HOOK screen, select "**SPID**" soft key, and check SPID #1 and SPID #2. Return to the Hook screen for PH#1 (Phone 1) and press "**Scroll Menu**" to reach the PH #2 Hook screen. Wait approx. 15 sec for Phone #2 to initialize with the switch. Go Off Hook and dial the number for phone #1.



- When the sonalert is heard, press "**Scroll Menu**" to move to Phone #1, press the "**Hook On/Off**" key to answer the call. Place one of the B-channels into loopback mode (**2nd Func.**, **Utility** key, **Scroll** to Loopback menu), enter the BERT menu (**2nd Func.**, **BERT**), and start a test over the other B-channel.

STRAIGHTAWAY:

- In the same manner as above, two technicians with Model 550A's can call each other. In this scenario, the first would call the second technician. The second technician would then call the first, using the PH#2 Hook screen. The called technician would place the incoming B-channel in loopback. Each technician would then initiate BER testing over the out-bound B-channel.

2.6 P-PHONE (EBS) TESTING

Electronic Business Set (EBS), or P-Phone, is a service provided by Northern Telecom DMS or SL switches. The service provides a user with Centrex-like features that aren't normally available on a conventional POTS line.

EBS service is provided through a non-loaded subscriber loop pair that carries conventional voice traffic and a secondary above voiceband signaling channel. In addition to Off Hook/On Hook and Dialing information, this secondary channel carries Line Status, Number ID, and Display information.

There may be several devices connected to an EBS line at the customer premise. Each device would have its own address in order to communicate with the switch. There is always a basic set with address "0" that terminates the line, normally at 900Ω. Add-on devices may include speaker phones or 18-button, 20-button, or 36-button add-on modules. The Model 550A can be configured for any address (0-7). The Primary telephone always uses address 0. Expansion units associated with the Primary telephone use addresses 1, 2, or 3. The Extention telephone always uses address 4. Expansion units associated with the Extention telephone use addresses 5, 6, or 7.

To verify P-Phone/EBS Service:

1) Configure the Model 550A for EBS/P-Phone

   - Use the "**Setup**" key to gain access to the EASY-USER-MODE Menu
     - If "EBS" is displayed on line 1 of the LCD, Select "**1**"=ACCEPT
     - If anything else is displayed on Line 1 of the LCD, select "**2**"=CHANGE.
       - Select Display Size (2x16, 2x24)
       - Select Device (Primary, 18-key, 20-key)
       - Select Station Address (0-7)
       - Selct "**1**"-ACCEPT.
   - After a short recalibration period, the LCD will display the "ON HOOK" menu.

2) Verify the Line Connection

   - Use the LINE INTERFACE Jack designated "2 Wire" for connection to the EBS/P-Phone network.
     - Once connected :

       "**Sync**" LED will light when communication with switch is established.

       Voltage & Current presence is indicated when the "**Sealing Current**" LED is lit.

       Polarity is indicated in the LCD display at the "**Status**" location:

       "None" = Not enough Voltage or Current
       "Norm" = Tip is Ground, Ring is Battery
       "Rev" = Tip and Ring are reversed

3) A Voice Call may now be placed using the "**Hook On/Off**" key

   - By going "OFF HOOK", the Model 550A will send an "OFF HOOK" Message on Key #1 for address "0". Dial Tone should be heard, and a call can then be placed. If a call comes into the Model 550A, "RINGING" will be displayed on the LCD Screen, and the SONALERT will sound. In order to answer an incoming call, go "OFF HOOK". Conversation can then take place. To end a call, go "ON HOOK".
   - The Key or Button Number may also be selected for incoming or outgoing calls by selecting the "**Utility**" Menu.
   - The Address the Model 550A sends can also be changed by selecting the "**Utility**" Menu and Scrolling to the "EBS STATION ADDRESS" Menu. For example, by entering the desired Address Number, the next OFF HOOK message sent to the Switch will have the new Address.

4) Access messages decoded (in English) from switch communications by pressing the "**#/Utility**" key and the "Scroll" key until the following screen displays:

```
0012 EBS MESSAGES
1=LCD 2=SERIAL 3=CLEAR
```

In the above example, the digits "0012" show that there are a total of 12 EBS messages that have been stored in the EBS message buffer. The EBS message buffer has the capability to store up to 128 message decodes. The second line of the LCD allows selection of displaying an abbreviated message on the LCD, outputing all of the detailed message decodes via the "DATA ACCESS" connector, or Clearing the message buffer by simply pressing the corresponding key.

The following is an example of an abbreviated message decode if the LCD is selected for output:

```
026 CPE>CO 1D-HKS On
1=UP 2=DOWN 3=RETURN
```

The number "026" represents the sequential message decode number. The "CPE>CO" provides information concerning the direction, in this example the direction is from "CPE" towards the "CO". The next displayed item "1D" is the hexadecimal representation of the message. "HKS On" is an abbreviated message decode stating that the Hook Switch is On Hook. Pressing "1" or "2" on the keypad will scroll through the messages. Pressing "3" will step back to the "EBS MESSAGES" display.

Some of the abbreviations with explanations are in the table below:

ABBREVIATION	MESSAGE
Ind*x*OFF	Indicator *x* (1-9) OFF
Ind0OFF	Indicator 10 OFF
Ind*x*WNK	Indicator *x* (1-9) WINK
Ind0WNK	Indicator 10 WINK
Ind*x*FLH	Indicator *x* (1-9) FLASH
Ind0FLH	Indicator 10 FLASH
Ind *x*ON	Indicator *x* (1-9) ON
Ind10ON	Indicator 10 ON
HardRst	Hard Reset
SoftRst	Soft Reset
PwrDown	Power Down Reset
ClsEcho	Close Echo
OpnEcho	Open Echo
AlrtOff	Alert-Off
AlrtOn	Alert-On
VoicOff	Voice-Off
VoiceOn	Voice-On
HSetOff	Handset-Off
HSetOn	Handset-On
BuzzOff	Buzzer-Off
BuzzOn	Buzzer-On
AABkOff	Auto Answer Back-Off
AABkOn	Auto Answer Back-On

For further explanations of specific messages, please refer to BELLCORE document TR73505, Issue B, Section 5.

Pressing "2" from the EBS MESSAGES menu will immediately send output of all the stored messages to the "DATA ACCESS" connector on the front panel. A terminal or printer (Serial) may be attached to the Data Access connector to "Print" the information out. The messages printed out are not abbreviated and have more detail than the LCD information. An example of the output when "2=SERIAL" is pressed follows:

```
0026 Direction..CPE->CO
     Address....0
     command....1D Hookswitch On-Hook
```

EBS/P-Phone Testing

2.6.1 Setup = Use "**Setup**" key for **EASY-USER-MODE** [Service Mode = EBS]

2.6.2 Connection = Use **LINE INTERFACE** Jack

2.6.3 Place A Call = Use "**Hook On/Off**" key

Polarity of the line is displayed above "STATUS" (lower right corner of LCD) in the "On/Off Hook" menu.

"NONE" = Not enough Voltage or Current
"NORM" = Tip is Ground, Ring is Battery
"REV" = Tip and Ring are reversed.

Additionally, the Model 550A may be used to change the Address and Call Appearance to activate other desired Buttons.

NOTE: *If the EBS/P-Phone optional interface (550A-23 EBS/POTS Interfaces) has not been ordered, "EBS" will not show on line 2 of the LCD as a Line Interface choice.*

2.7 POTS TESTING

2.7.1 Setup = Use "**Setup**" key for **EASY-USER-MODE** [Service Mode = POTS]

2.7.2 Connection = Use **LINE INTERFACE** Jack

2.7.3 Place A Call = Use "**Hook On/Off**" key

NOTE: *If available as a service, Incoming call Line ID (date, time, and number) will be displayed on the second ring.*

Polarity of the line is displayed above "STATUS" (lower right corner of LCD) in the "On/Off Hook" menu.

"NONE" = Not enough Voltage or Current
"NORM" = Tip is Ground, Ring is Battery
"REV" = Tip and Ring are reversed.

2.8 NT1 REPLACEMENT

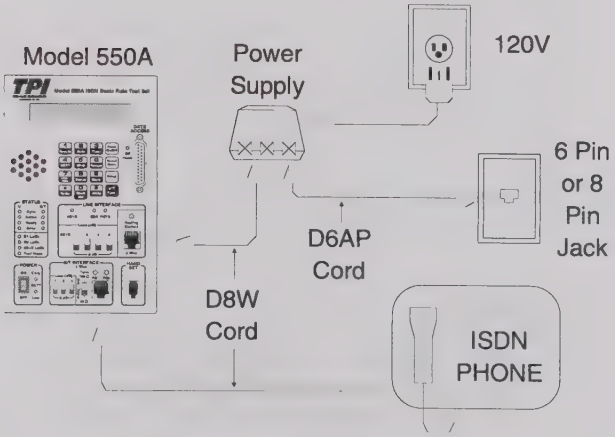
2.8.1 Setup = Use "**Setup**" key for **EASY-USER-MODE**
[Service Mode = ISDN]
[ISDN Mode = NT1]
[Interface = 2B1Q]

2.8.2 Connection = Use **LINE INTERFACE** Jack

2.8.3 Errored Second Testing = Use "**1/Results**" key

2.8.4 Network Originated Loopback Testing
STATUS LED's will indicate Loopback status

NOTE: *The Model 550A will pass power from the "U" Interface jack to the "S/T" Interface jack. If a phone were connected to the "S/T" Interface jack, the phone must be powered by a separate power supply.*



Replacing a NT1 with the Model 550A.

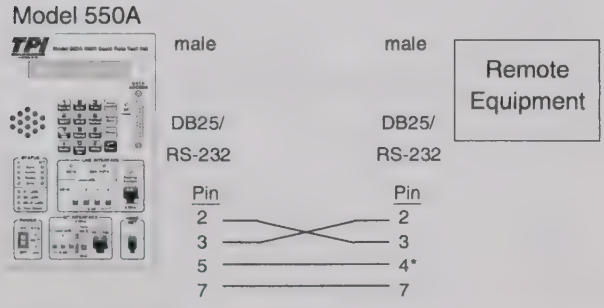
2.9 MONITOR D-CHANNEL PACKETS (Option)

2.9.1 Setup = Use "**Setup**" key for **EASY-USER-MODE**
[Service Mode = ISDN]
[ISDN Mode = NT1/TE]
[Interface = 2B1Q]
[Call Control = 5ESS, DMS-F, or Nat'l]

2.9.2 Monitoring of received "D" channel packets with remote equipment is optionally available, via the DB-25/RS-232 connector on the front panel labelled "DATA ACCESS". The "D-Channel Monitor" is enabled through the "**Utility**" menus. Information displayed will be in the HEX format and English language.

2.9.3 The communication parameters for the Model 550A are factory pre-set. Consequently, communication **parameters** for remote equipment will need to be set to match those of the Model 550A. These are **9600 Baud, No Parity, 8 Data Bits, 1 Stop Bit** (Baud rate selectable through "**Utility**" menus).

2.9.4 When connecting the remote equipment directly to the Model 550A, a **null-modem cable** should be used. This type of cable has pins 2 and 3 reversed.



NOTE: ** Pin 5 (CTS) on Model 550A is used for data transfer flow control. This may be needed for slow devices (i.e., printers). If enabled from Model 550A "Utility" menu (Flow Control = On), the Model 550A will not transfer data unless pin 5 is enabled.*

Output example:

Setup from TE

```
TE->NT:C SAPI:000 TEI:104 Time00:01:36.9
I Ns=003 Nr=003 P/F=0
PD=08............Call Reference:001
M 05 SETUP
I 04 BEARER_CAPABILITY.......Len= 3
 80 Coding Standard...........CCITT
  Transfer Capa..............Speech
 90 Transfer Mode............Circuit
  Transfer Rate............64 kbit/s
 A2 Layer 1 Protocol..........u-law
I 18 CHANNEL ID..............Len= 1
 8B Indicated Channel.....Exclusive
  Channel Selection.............Any
  Channel Identifier.......Not D-CH
I 24 TERMINAL CAP............Len= 1
 02 Coding Standard.............Any
  Capability.........Type 2 stimulus
I 36 SWITCHHOOK..............Len= 1
 01 Off-hook
I 96 Shift         Locking Codeset=6
I 23 ORIG CALL APPEAR........Len= 1
 01 Off-hook
I 26 ENDPOINT IDENTIFIER.....Len= 2
 01 USID........................001
 E8 TID........................104
  Interpreter...................1
Hex:00 D1 06 06 08 01 01 05 04 03 80 90
  A2 18 01 8B 24 01 02 36 01 01 96 23
  01 01 26 02 01 E8
```

```
NT->TE:C SAPI:000 TEI:104 Time00:01:37.2
I Ns=003 Nr=004 P/F=0
PD=08............Call Reference:001
M 0D SETUP ACKNOWLEDGE
I 18 CHANNEL ID..............Len= 1
 89 Indicated Channel.....Exclusive
   Channel Selection..............B1
   Channel Identifier.......Not D-CH
I 34 SIGNAL..................Len= 1
 00 Dial Tone on
I 96 Shift          Locking Codeset=6
I 3C DISPLAY FIELD...........Len= 4
 11 Display Mode..............Normal
   Submode....................Direct
01 Field Type........Call Appear ID
   INFO:1
Hex:02 D1 06 08 08 01 81 0D 18 01 89 34
   01 00 96 3C 04 11 01 20 31
TE->NT:C SAPI:000 TEI:104 Time00:01:42.3
I Ns=004 Nr=004 P/F=0
PD=08............Call Reference:001
M 7B INFORMATION
I 2C KEYPAD..................Len= 1
 33 Keypad info = 3
Hex:00 D1 08 08 08 01 01 7B 2C 01 33
```

Network Acknowledgement

TE Dialing

2.10 ONE PERSON ISDN BRI TURN-UP

2.10.1 Equipment Model 550A ISDN Basic Rate Test Set

Model 560B ISDN Dial Up Test Unit

2.10.2 General Information

The TPI Model 550A ISDN Portable Test Set is used to conduct testing of ISDN circuits at the Customer Premise or the main Distribution Frame. The Model 550A's operating modes allow it to function as a Network Termination [NT1], as Terminal Equipment [TE], or as both. It may be connected to either the Digital Subscriber Loop [DSL], or the S/T Interface. Once connected, the Model 550A will allow the technician to perform line quality measurements, place Voice and Data calls, setup loopbacks, conduct BERT testing, and verify translations.

The TPI Model 560B ISDN Dial Up Test Unit is used for automated assistance in the turning up of new ISDN circuits. The Model 560B is normally installed permanently in the Central Office (CO) in a 19-inch rack. The CO will assign a number to allow a test technician to dial the Model 560B. Once accessed, the Model 560B will allow the technician to test the line being called on by ringing the technician back, setting up loopbacks, and/or allowing BERT testing.

2.10.3 Equipment Set-Up

Model 550A

Connection to the ISDN line are made at the LINE INTERFACE jack on the front panel of the Model 550A.

1) When the Model 550A is first used on an ISDN circuit, the technician will have to set the unit up in accordance with the switch and other line parameters. For example, upon power up of the Model 550A, a screen such as the screen shown below will be displayed, which reflects the last setup:

```
ISDN NT1TE 2B1Q 5ESS PP
1=ACCEPT  2=CHANGE
```

2) If the setup needs to be changed, select "**2**" and follow the menu setup prompts.

Model 560B

Connections to the ISDN Switch are made at the Model 560B rear panel, via the terminal block [near the center].

1) Connect the Tip lead to the terminal marked "**T**".

2) Connect the Ring lead to the terminal marked "**R**" of the line that is dedicated to the Model 560B.

3) The line connected to the Model 560B must be setup as if it were an actual ISDN line being supplied to a customer with translation for Automatic Number Identification [ANI].

4) When the Model 560B is first installed, the technician will have to set the unit up in accordance with the switch and other line parameters, otherwise the unit will be configured with the last setup used. For example, upon power up, a screen such as the screen shown below will be displayed, which reflects the last setup:

```
ISDN NT1TE 2B1Q 5ESS PP
1=ACCEPT  2=CHANGE
```

5) If the setup needs to be changed, select "**2**" and follow the menu setup prompts.

2.10.4 Voice Turn-up Procedure

Once the Model 560B has been setup properly, the STATUS LED's for "**Sync**", "**Active**" and "**Ready**" should illuminate GREEN.

Once the Model 550A has been setup properly, the STATUS LED's for "**Sync**", "**Active**" and "**Ready**" should illuminate GREEN.

1) Go OFF HOOK. DIAL TONE should be heard [if not, check SPID].
2) The Model 550A defaults to Voice service.
3) Enter the Model 560B access number.
4) The Model 560B will automatically answer and announce "TPI Automated Test Line", followed by the calling party number, to the Model 550A.
5) Once the Calling Party Number is announced, the technician should hang up, by going ON HOOK with the Model 550A.
6) The Model 560B then goes OFF HOOK and places a call back to the Model 550A.
7) When the Model 550A answers, the Model 560B will announce "TPI Automated Test Line, Entering Loopback", then enter a loopback state on the assigned "B" channel, allowing the technician to use the BERT feature of the Model 550A to verify the quality of the connection.
8) The Model 560B will release automatically if the caller hasn't hung up after 15 minutes.
9) The Model 560B is now ready for the next call.

2.10.5 Circuit Switched Data Turn-up Procedure

1) Same as Voice, except the Model 550A must be configured for Circuit Switched Data via the UTILITY Menu, prior to connection to the line under test.

2.10.6 D-Packet Data Turn-up Procedure

1) Configure the Model 550A for Voice and verify DIAL TONE, upon going OFF HOOK. Hang up by going ON HOOK. Use the "**Utility**" Menu to change the Bearer capability to "**D PKT**".
2) Using the Model 550A, Go OFF HOOK and the display should say "**READY FOR CALL / ENTER NO. W/KEYS**".
3) Using the Model 550A, enter the Model 560B access number, followed by "**#**", to send the number.
4) The Model 560B will automatically answer and send the calling party number back in a D-Packet message.
5) The Model 550A should display "**Connect_D**", followed by the Calling Party Number.
6) Using the Model 550A, hang up by going ON HOOK.
7) The Model 560B will go OFF HOOK and dial the Model 550A.
8) When the Model 550A sees the D-Packet call come in, it will automatically answer.
9) The Model 560B will then send a message to the Model 550A stating "**560B**". Next, the Model 560B will enter into a Packet Echo mode.
10) The Model 550A can now be used to send the Quick Brown Fox message by selecting "**1**" on the keypad.

11) When this message reaches the Model 560B, it will be sent back to the Model 550A and displayed on the screen.

12) The Model 550A can clear the screen [Select "**2**"], and resend the message [Select "**1**"]. If this message is received error free, the quality of the connection has been verified.

13) The Model 550A will release the call automatically if the caller hasn't hung up after 15 minutes.

APPENDIX A

QUICK REFERENCE

QUICK REFERENCE

HOW TO MAKE A VOICE CALL

*A **"SPID"** (Service Profile Identifier) will normally have to be entered **via the "Setup" menu or key "5/SPID"** (or the call will be denied).*

*The **switch type must be selected**, and the **"TEI"** (Terminal Endpoint Identifier) may need to be **set via the "Setup" menu**.*

***ISDN switches may take up to a minute to initialize** when access is gained and/or when a mode change takes place. If the "**Hook On/Off**" key is pressed during this initialization period, a "**WAITING FOR RESPONSE**" message may be displayed.*

❶ GO OFF HOOK by pressing the "**Hook On/Off**" keypad button (will hear dial tone).

❷ ENTER THE NUMBER using the keypad (LCD screen will display number entered and channel selected).

❸ CONVERSATION may now take place using the "**Hands Free**" feature (an external handset may also be connected).

*TO END a Voice Call, go **On Hook** by pressing the "**Hook On/Off**" keypad button.*

QUICK REFERENCE

TROUBLESHOOTING TIPS

❶ For most circuits, the "**SPID**" **must be entered** prior to going off hook (use "**5/SPID**" keypad selection to check the SPID).

❷ "**TEI**" **assignment** must have been made before a dial tone can be heard (check for the "**Ready**" LED or use the "**Status**" menu to verify Layer 2 state).

If TEI assigned, LCD = "**MULT FRAME EST**"

If TEI *not* assigned, LCD = "**TEI UNASSIGNED**".

❸ If dial tone has not been gained, or if the LCD screen displays a "**DENIED**" message, use the "**Status**" menu to check the **CAUSE INFO**, which will give a diagnostic cause message.

❹ If set-up needs to be checked, press the "**Setup**" keypad button, which will prompt the operator to answer several setup related questions that will configure the Model 550A to the circuit and switch being accessed.

QUICK REFERENCE

HOW TO MAKE A DATA CALL

*A **"SPID"** (Service Profile Identifier) will normally have to be entered **via the "Setup" menu** or key "5/SPID" (or the call will be denied).*

*The **switch type must be selected**, and the "**TEI**" (Terminal Endpoint Identifier) may need to be **set via the "Setup" menu**.*

***ISDN switches may take up to a minute to initialize** when access is gained and/or when a mode change takes place. If the "**Hook On/Off**" key is pressed during this initialization period, a "**WAITING FOR RESPONSE**" message may be displayed.*

❶ Press the "**#/Utility**" keypad button.

❷ Press the "**Scroll Menu**" keypad button until the "**BEARER CAPABILITY**" sub-menu is gained.

❸ Select "**2=DATA**".

❹ A Circuit Switched Data Call may now be placed, just like a voice call.

A - GO OFF HOOK, by pressing the "**Hook On/Off**" keypad button(will hear dial tone).

B - ENTER THE NUMBER, using the keypad (LCD screen will display number entered and channel selected).

C - BERT testing may now take place.

*TO END a Data Call, Go **On Hook** by pressing the "**Hook On/Off**" keypad button.*

QUICK REFERENCE

TROUBLESHOOTING TIPS

❶ It is best to verify a Voice Call can be made successfully, prior to attempting a Data Call.

❷ For most circuits, the "**SPID**" **must be entered** prior to going off hook (use "**5/SPID**" keypad selection to check the SPID).

❸ "**TEI**" **assignment** must have been made before a dial tone can be heard (check for the "**Ready**" LED or use the "**Status**" menu to verify Layer 2 state).
If TEI is assigned, LCD = "**MULT FRAME EST**"
If TEI is *not* assigned,
LCD = "**TEI UNASSIGNED**".

❹ If dial tone has not been gained, or if the LCD screen displays a "**DENIED**" message, use the "**Status**" menu to check the **CAUSE INFO**, which will give a diagnostic cause message.

❺ If set-up needs to be checked, press the "**Setup**" keypad button, which will prompt the operator to answer several setup related questions that will configure the Model 550A to the circuit and switch being accessed.

QUICK REFERENCE

HOW TO MAKE A DUAL B-CHANNEL CALL

Complete the "Setup" *menu selections for mode, line code, call control, bearer service, etc.*

Complete the selections for second call, dual TEI, and two SPID entries ***before*** *accessing "PH #2".*

ISDN switches may take up to a minute to initialize *when access is gained and/or when a mode change takes place. If the "**Hook On/Off**" key is pressed during this initialization period, a "**WAITING FOR RESPONSE**" message may be displayed.*

1. Use the "**Setup**" key to configure the test set for the line under test.
2. Press the "**Utility**" key. Use the "**Scroll Menu**" key to move to the "SECOND CALL" screen. The Model 550A defaults to "OFF". Select "ON".
3. Use "**Scroll Menu**" to move to the "DUAL TEI MODE" screen. The selection must be "ON" unless the line under test is a 5ESS Point-to-Point custom or National ISDN.
4. Press the "**Setup**" key then "**1**", to accept, to move to the HOOK screen.
5. Press the "**5/SPID**" soft key and check SPID #1.
6. Press the "**Scroll Menu**" key after checking SPID #1 to move to the ENTER SPID #2 screen. Enter SPID #2. Press the "**Setup**" key then "**1**", to accept, to return to the HOOK screen for PH #1 (Phone number 1). Pressing "**Scroll Menu**" moves back and forth between the PH #1 and PH #2 HOOK screens.
7. Go Off Hook by pressing the "**Hook On/Off**" key from the PH #1 screen. Enter the number and establish the call.

❽ Press "**Scroll Menu**" to reach the PH #2 Hook screen. Go Off Hook and place a call by entering a number.
❾ Bit Error Testing can be initiated over either of the B-Channels.

*TO END a call from either PH #1 or PH #2 Hook screen, go **On Hook** by pressing the "**Hook On/Off**" key.*

TROUBLESHOOTING TIPS

❶ If a second Voice call is attempted and cannot be accomplished, check the Setup. Lines with 5ESS Custom and National call controls and Pt-to-Pt service will not allow dual Voice calls.

❷ Check correct SPID entry. Two required for all setups except 5ESS Pt-to-Pt custom.

❸ Check correct TEI setting (Dual On or Off). Use the "Utility" menus.

❹ "**TEI**" **assignment** must have been made before a dial tone can be heard. (Check for the "**Ready**" LED or use the "**Status**" menu to verify Layer 2 state).

If TEI is assigned, message on second line of LCD = "**MULT FRAME EST**"

If TEI is not assigned, message on second line = "**TEI UNASSIGNED**".

❺ If dial tone has not been gained, or if the LCD screen displays a "**DENIED**" message, use the "**Status**" menu to check the **CAUSE INFO**, which will give a diagnostic cause message.

❻ If set-up needs to be checked, press the "**Setup**" keypad button, which will prompt the operator to answer several setup related questions that will configure the Model 550A to the circuit and switch being accessed.

QUICK REFERENCE

HOW TO MAKE A D-CHANNEL PACKET DATA CALL

*A **"SPID"** (Service Profile Identifier) willmally have to be entered **via the "Setup menu** or key "5/SPID" (or the call will be denied).*

*The **switch type must be selected**, and the **"TEI"** (Terminal Endpoint Identifier) may need to be **set via the "Setup" menu**.*

***ISDN switches may take up to a minute to initialize** when access is gained and/or when a mode change takes place. If the **"Hook On/Off"** key is pressed during this initialization period, a **"WAITING FOR RESPONSE"** message may be displayed.*

---

❶ Press the "**#/Utility**" keypad button.
❷ Press the "**Scroll Menu**" keypad button until the "**BEARER CAPABILITY**" sub-menu is gained.
  – Select "**3=D-PKT**".
❸ Press the "**Hook On/Off**" keypad button (the lower LCD display line will indicate "**READY FOR CALL**").
❹ **ENTER THE NUMBER** using the keypad.
❺ Press the "**#/Utility**" keypad button to send the call (lower LCD line = "**CONNECT_D**").
❻ Press the "**1/Results**" keypad button to send the following message over the D-Channel "The quick brown fox jumped over the lazy dog 012".
❼ The Model 550A will display any information coming to it on the LCD screen.

*TO END a D-Channel Packet Data Call, Go **On Hook** by pressing the **"Hook On/Off"** keypad button.*

QUICK REFERENCE

TROUBLESHOOTING TIPS

❶ It is best to verify a Voice Call can be made successfully, prior to attempting a Data Call.

❷ For most circuits, the "**SPID**" **must be entered** prior to going off hook (use "**5/SPID**" keypad selection to check the SPID).

❸ "**TEI**" **assignment** must have been made before a dial tone can be heard (check for the "**Ready**" LED or use the "**Status**" menu to verify Layer 2 state).
If TEI is assigned, LCD = "**MULT FRAME EST**"
If TEI is *not* **assigned**,
LCD = "**TEI UNASSIGNED**".

❹ If dial tone has not been gained, or if the LCD screen displays a "**DENIED**" message, use the "**Status**" menu to check the **CAUSE INFO**, which will give a diagnostic cause message.

❺ If set-up needs to be checked, press the "**Setup**" keypad button, which will prompt the operator to answer several setup related questions that will configure the Model 550A to the circuit and switch being accessed.

QUICK REFERENCE

ONE PERSON VOICE TURN-UP PROCEDURE

Once the Model 560B has been set-up properly, the "**Sync**", "**Active**" and "**Ready**" STATUS LED's should illuminate.

Once the Model 550A has been set-up properly, the "**Sync**", "**Active**" and "**Ready**" STATUS LED's should illuminate.

1. Go OFF HOOK. DIAL TONE should be heard [if not, check SPID].
2. The Model 550A defaults to Voice service.
3. Enter the Model 560B access number.
4. The Model 560B will automatically answer and announce "Hello, TPI Automated Test Line", followed by the service, calling party number, and announce "Hang up for call back" to the Model 550A.
5. The technician should now hang up, by going ON HOOK with the Model 550A.
6. The Model 560 then goes OFF HOOK and places a call back to the Model 550A.
7. When the Model 550A answers, the Model 560B will announce "Hello, TPI Automated Test Line. Entering Loopback", then enter a loopback state on the assigned "B" channel, allowing the technician to use the BERT feature of the Model 550A to verify the quality of the connection.
8. The Model 560B will release automatically if the caller hasn't hung up after 15 minutes.
9. The Model 560B is now ready for the next call.

ONE PERSON CIRCUIT-SWITCHED DATA TURN-UP

1. Same as Voice, except the Model 550A must be configured for Circuit Switched Data via the "**Utility**" sub-menu, prior to connection to the line under test.

QUICK REFERENCE

ONE PERSON D-PACKET DATA TURN-UP PROCEDURE

1. Configure the Model 550A for Voice service and verify DIAL TONE, upon going OFF HOOK. Hang up by going ON HOOK. Use the "**Utility**" sub-menu to change the Bearer capability to "**D PKT**".
2. Using the Model 550A, go OFF HOOK and the display should say "**READY FOR CALL / ENTER NO. W/KEYS**". Using the Model 550A, enter the Model 560B Access Number, followed by "**#**", to send the number.
3. The Model 560B will automatically answer and send the calling party number back in a D-Packet message.
4. The Model 550A should display "**Connect_D**", followed by the calling party number. Using the Model 550A, hang up by going ON HOOK.
5. The Model 560B will go OFF HOOK and dial the Model 550A.
6. When the Model 550A sees the D-Packet call come in, it will automatically answer.
7. The Model 560B will then send a message to the Model 550A stating "TPI Automated Test Line, Entering Loopback". Next, the Model 560 will enter into a Packet Echo mode.
8. The Model 550A can now be used to send the "Quick Brown Fox" message by selecting "**1**" on the keypad. When this message reaches the Model 560B, it will be sent back to the Model 550A and displayed on the screen.
9. The Model 550A can clear the screen [Select "**2**"], and resend the message [Select "**1**"]. If this message is received error free, the quality of the line has been verified.
10. The Model 550A will release the call automatically if the caller hasn't hung up after 15 minutes.

QUICK REFERENCE

2B1Q EOC MESSAGES

"2B+D LOOPBACK"

"B1 LOOPBACK"

"B2 LOOPBACK"

"REQ CRPT CRC"

"NOTIFY CRPT CRC"

"RETURN NORMAL"

"HOLD STATE"

"UNABLE COMPLY ACK" by NT1

LAYER 1 MESSAGES

"H1 FULL RESET" = Resetting our interface

"H2 ALERTING" = Trying to wake up network

"H6 ISW SYNC" = Sync achieved

"H8 ACTIVE" = Interface ready for use

"H10 TEAR DOWN" = Taking interface down

QUICK REFERENCE

AT&T N-CHANNEL RECEIVED MESSAGES

"D 1 NT 2B+D LB" = Loopback 2B+D at NT1
"D 2 NT B1 LB" = Loopback Chan. B1 at NT1
"D 3 NT B2 LB" = Loopback Chan. B2 at NT1
"D 6 ACT MODE/IDLE" = Activated Mode/Idle
"D 8 ACT REQUEST" = Activation Request
"D 15 DEACTIVATED" = Out of Service

AT&T N-CHANNEL TRANSMITTED MESSAGES

"U 1 AWAKE INDICATION" = Request by TE to activate S/T Interface
"U 6 ACT MODE/IDLE = Idle condition
"U 7 S/T NOT EST" = Lack of sync at S/T Interface
"U 15 DEACTIVATED" = Out of Service

LAYER 2 INFORMATION MESSAGES

"TEI UNASSIGNED" = Power up state
"ASSIGN AWAITING TEI" = Requesting TEI state
"ESTABLISH AWAITING TEI" = Requesting TEI state
"TEI ASSIGNED" = TEI has been assigned
"AWAITING ESTABLISHMENT" = Not yet in multiple• frame state
"AWAITING RELEASE" = Release request from multiple frame state
"MULTIPLE FRAME ESTABLISHED" = Completed SABME / UA (This is the state the 550A should be in when ready to place a call.)
"TIMER RECOVERY" = Error State

QUICK REFERENCE

LAYER 3 INFORMATION MESSAGES

"NULL STATE" = No call exists
"CALL INIT" = (Call Initiated) The state exists for an outgoing call.
"OVERLAP SENDING" = Call establishment request acknowledgement has been received permitting additional call information to be sent in the overlap mode.
"OUT CALL PROC" = (Outgoing Call Proceeding)
"CALL DELIVERED" = Remote user alerting has been initiated.
"CALL PRESENT" = State exists for an incoming call.
"CALL RECEIVED" = Incoming call not yet answered.
"CONNECT REQUEST" = Incoming call answered, waiting to be awarded.
"IN CALL PROC" = (Incoming Call Proceeding)
"CALL ACTIVE" = Incoming call or outgoing call state.
"DISCONNECT REQ" = (Disconnect request) Request for network to clear the end-to-end connection.
"DISCONNECT IND" = (Disconnect Indication) Receipt of invitation to disconnect.
"SUSPEND REQUEST" = Request for network to suspend the call.
"RESUME REQUEST" = Request for network to resume a previously suspended call.
"RELEASE REQUEST" = Request for network to release a call.
"OVERLAP RECEIVE" = (Overlap Receiving) Network is prepared to receive additional call information (if any) in overlap mode.
"IDLE STATE" = (Idle Call State) No calls in progress.

QUICK REFERENCE

CAUSE MESSAGES

1	"UNASSIGNED NUM"	2	"NO ROUTE TO NET"
3	"NO ROUTE TO DEST"	6	"CHN UNACCEPTABLE"
7	"CALL AWARDED"	16	"NORMAL CLEARING"
17	"USER BUSY"	18	"NO USER RESPONSE"
19	"ALERTING NO ANS"	21	"CALL REJECTED"
22	"NUMBER CHANGED"	26	"NON SELECTED CLR"
27	"DEST OUT ORDER"	28	"INVALID NUM FMT"
29	"REQ FACILITY REJ"	30	"RSP TO STAT ENQ"
31	"NORM UNSPEC"	34	"NO CHAN AVAIL"
35	"QUEUED"	38	"NET OUT ORDER"
41	"TEMP FAILURE"	42	"NETWORK CONGEST"
43	"INFO DISCARDED"	44	"CHN NOT AVAIL"
47	"RESOURCE UNAVAIL"	49	"QUAL SVC UNAVAIL"
50	"FAC NOT SUBSCRIB"	52	"OUT CALLS BARRED"
54	"IN CALLS BARRED"	57	"BEARCAP NOT AUTH"
58	"BEARCAP NOT AVAI"	63	"SERVC NOT AVAIL"
65	"BEARSVC NOT IMPL"	66	"CHN TYPE NOT IMPL"
69	"REQ FAC NOT IMPL"	70	"RES DIGITAL ONLY"
79	"SVC NOT IMPLEMNT"	81	"INVAL CALL REF"
82	"CHN NOT EXIST"	83	"NO CALL ID"
84	"CALL ID IN USE"	85	"NO CALL SUSPEND"
86	"CALL CLEARED"	88	"INCOMPAT DEST"
91	"NET NOT EXIST"	95	"INVALID MSG"
96	"INFOELEMENT MISS"	97	"MSG TYPE NONEXST"
98	"MSG NOT COMPAT"	99	"ELEMENT NONEXIST"
100	"INVAL INFO"	102	"RECOV ON TMR EXP"
111	"PROTOCOL ERROR"	127	"INTERWORKING"

APPENDIX B

GLOSSARY

AMI *Alternate Mark Inversion* - A switch vendor's proprietary line code (i.e., AT&T AMI, NTI AMI).

ANI *Automatic Number Identification* - Ability of the network to notify the called party of the calling party's number.

B-Channel *Bearer Service Channel* - Operates at 64 Kbps and carries user voice and data.

BERT *Bit Error Testing*

BPV *Bipolar Violation*

BRI *Basic Rate Interface* - One of the access methods to an ISDN circuit. Comprising of either 1B+D or 2B+D channels.

BRITL *Basic Rate Interface Dial Up Test Line* - A feature of AT&T switches.

Cause Message - Diagnostic messages describing the "cause" of a problem.

CCIS *Common Channel Interoffice Signaling* - North American version of Signaling System 6.

CCS *Common Channel Signaling* - Out of band network signaling whereby several voice trunks share a common signaling channel (i.e., SS6 and SS7).

CLASS *Custom Local Area Signaling Services* - A set of services that is offered by telcos that have implemented SS7.

CODEC *Coder/Decoder* - Device used to convert analog signals to digital bit streams and vice versa.

CPE *Customer Premise Equipment* - Devices or equipment that the customer provides to interface with the telephone company.

CRC *Cyclic Redundancy Check* - A mathematical algorithm used to detect bit errors in data transmission.

D-Channel - The out of band signaling channel that carries ISDN network signals. It can also be used to carry packet-mode user data. The D-Channel operates at 16 Kbps in the BRI and 64 Kbps in the PRI.

DCE *Data Circuit-terminating Equipment*

DSL *Digital Subscriber Line*

DTE *Data Terminal Equipment*

EBS *Electronic Business Set* - Also known as P-Phone, this is a proprietary service provided by Northern Telecom DMS or SL switches.

EOC *Embedded Operations Channel*

HDLC *High-level Data Link Control*

IEC *Inter-Exchange Carrier* - In the U.S. is a long distance telephone company (also abbreviated IC and IXC).

ISDN *Integrated Services Digital Network*

ISPBX *Integrated Services Private Branch Exchange* - A term describing an ISDN-compatible PBX.

IVDT *Integrated Voice/Data Terminal* - An ISDN terminal that allows both voice and data communications.

LAPD *Link Access Procedures on the D-Channel* - The ISDN data link layer protocol specified for the D-Channel.

M-Channel - A 4 Kbps maintenance channel for NT1-LE communication over the 2-wire BRI circuit

Multi Point - Configuration that supports multiple terminal equipment devices.

NI-1 *National ISDN-1* - A standard call control.

NT1 *Network Termination type 1* - The ISDN device responsible for the termination of the ISDN transmission facility at the customer premises.

NT2 *Network Termination type 2* - An ISDN device responsible for on premises communications distribution, such as a PBX, LAN, or Host Computer.

Octet - An eight (8) bit quantity; used in lieu of the term "Byte".

PLP *Packet Layer Protocol* - The X.25 Level 3 protocol.

Point to Point - Point to point connection.

POTS *Plain Old Telephone Service*

PRI *Primary Rate Interface* - One of the access methods to an ISDN circuit. Comprising of 23 B-Channels and one D-Channel (23B+D).

SAPI *Service Access Point Identifier* - A subfield in the LAPD address field which indicates the type of Level 3 service being obtained.

Sonalert - An audible "beep" indicating an error condition or signaling an incoming call.

SPID *Service Profile Identifier* - A number used by Terminal Equipment to request identification from the switch on a multipoint circuit.

SPM *Service Profile Management*

SS6 *Signaling System No. 6* - CCITT version of CCIS, one of the first common channel signaling networks.

SS7 *Signaling System No. 7* - The high speed, digital common channel signaling network required for ISDN applications.

S/T Interface - The standard 4-wire (2 Rx, 2 Tx) ISDN Interface used by ISDN terminals and is the physical interface on the terminal side of a NT1.

STP *Signal Transfer Point* - A SS7 switching point.

TE *Terminal Equipment* - Any ISDN compatible device that may be placed on the network, such as a telephone, IVDT, PBX, TV, PC, etc.

TE1 *Terminal Equipment type 1* - ISDN compatible terminal equipment.

TE2 *Terminal Equipment type 2* - Non-ISDN compatible terminal equipment.

TEI *Terminal Endpoint Identifier* - A subfield in the LAPD address field that identifies a given TE device on the ISDN interface.

TID *Terminal Identifier*

Transport Layer *Layer 4 of OSI Reference Model* - Primarily responsible for error free communication between two hosts across the subnetwork.

2B1Q *Two Binary One Quaternary* - A signaling method used across the 2-wire BRI (U reference point). 2B1Q is a four level line code associating 2 bits to each line signal.

U Interface - The physical 2-wire echo cancelling interface on the network side of a NT1.

USID *User Service Identifier*

INDEX

2B1Q, *See* Interfaces
2B1Q Mode, 1-51 to 1-52

A
Accessories, 1-76 to 1-77
AMI, B-1
ANI, B-1

B
B-Channel, 1-46, 1-53, B-1
Backlighting, *See* LCD Backlight
Backspace, 1-30, 1-46, 1-54, 1-61
Basic Rate Interface, 1-2, B-1
Batt. Low LED, *See* Indicators
Battery Recharge, 1-6, 1-11, 1-80
Bearer Capability, 1-53
BERT, *See* Bit Error Testing
Bit Error Testing, 1-26, B-1
BRITL, 1-32 to 1-35, B-1

C
Cables, 1-76 to 1-77
Calling, 1-63 to 1-74
    Data, 1-53, 1-69 to 1-71, A-3 to A-4
    D-Packet, 1-53, 1-72 to 1-74, A-7 to A-8
    Dual B-Channel, 1-53, 1-68, 2-12 to 2-16
    Voice, 1-53, 1-66 to 1-67, A-1 to A-2
Call Appearance, 1-58
Call Control, 1-50
Calibration, 1-78

Cause, 1-37 to 1-38, A-14

CCIS, B-1

CCS, B-1

Circuit-Switched Turn-Up, 2-32, A-9

CLASS, B-1

CODEC, B-1

Connections, 1-7
- Data Access, 1-9
- Hand Set, 1-15
- Line Interface, 1-13
- S/T Interface, 1-17 to 1-19

Contrast, *See* LCD Contrast

Controls, 1-8 to 1-19
- Keypad, 1-9, 1-20 to 1-75
- Loss Switches, 1-13, 1-17
- Term Switch, 1-17

CPE, B-1

CUD, 1-54

CUG, 1-55

D

Data Access, *See* Connections

Data Calls, 1-69 to 1-71, A-3 to A-4

D-Channel, B-2

D-Channel Monitor, 1-57, 2-25 to 2-27

D-Channel Packet Data Calls, 1-72 to 1-74, A-7 to A-8
- D-Packet Options, 1-54 to 1-56

D-Channel Packet Data Turn-Up, 2-32 to 2-33, A-10

DCE, B-2

Description
Operational, 1-81
Physical, 1-6 to 1-7, 1-80
Dimensions, 1-6, 1-80
DSL, B-2
DTE, B-2
Dual B-Channel Calls, 1-28, 1-50, 1-68, 2-12 to 2-16

E

Easy-User-Mode, 2-2 to 2-6
EBS, 1-58 to 1-59, 2-17 to 2-22, B-2
EOC, B-2
Error Counters, 1-22, 1-24

F

Feature Verification, 1-32 to 1-35

H

Hand Set, *See* Connections
HDLC, B-2

I

IEC, B-2
Indicators, 1-9 to 1-17, 1-83 to 1-85
Batt. Chrg LED, 1-11, 1-85
Batt. Low LED, 1-11, 1-85
Line Interface LEDs, 1-13, 1-84
Off Hook LED, 1-9, 1-83
Sealing Current LED, 1-13, 1-84
Status LEDs, 1-15, 1-83
S/T Interface, 1-17, 1-83
Interface Select, 1-36

Interfaces, 1-1, 1-77, 1-80, 1-81, 1-82
- 2B1Q, 1-1, 1-5, 1-77, 1-80, 1-81, 1-82, B-4
- LINE, 1-2, 1-13, 1-80, 1-82, 2-10
- S/T, 1-1, 1-4, 1-17 to 1-19, 1-80, 1-81, 1-82, 2-11, B-3

ISDN, 1-2 to 1-5, B-2
- 2B1Q Line Code, 1-5
- Basic Rate Interface, 1-2, B-1
- Network Termination (NT), 1-4, B-3
- S/T Interface, 1-4, B-3
- Terminal Equipment (TE), 1-5, B-4
- U Interface, 1-5, B-4

ISPBX, B-2

IVDT, B-2

K

Keypad, *See* Controls

L

LAPD, B-2

LCD, 1-9
- Backlight, 1-52
- Contrast, 1-60

LCN, 1-55

Line Interface, *See* Interfaces

Loopbacks, 1-60

Loss Insertion, *See* Controls - Loss Switches

LT Mode, 1-51

M

M-Channel, 1-38, B-2

Maintenance, 1-78 to 1-79

Measurements, 1-2, 1-22, 1-82

Mode LED's, *See* Indicators

Modes of Operation, 1-81
- NT1, 1-4, 2-24
- TE, 1-5, 2-11
- NT1/TE, 2-10

Multipoint Operation, 1-30 to 1-31, B-2

N

NI-1, B-2

NT1, B-3

NT2, B-3

NTI AMI, *See* Interfaces

NTI Stimulus Release #, 1-58

O

Octet, B-3

Off Hook LED, *See* Indicators

One Person ISDN BRI Turn-Up, 2-28 to 2-33, A-9 to A-10
- Voice Turn-Up, 2-31, A-9
- Circuit-Switched Turn-Up, 2-32, A-9
- D-Channel Packet Data Turn-Up, 2-32 to 2-33, A-10

Operational Specifications, *See* Specifications

P

Physical Description, *See* Description

Physical Specifications, *See* Specifications

PLP, B-3

Point-to-Point, B-3

POTS, 1-60, 2-23, B-3

Power, 1-11, 1-80
Power Up, 2-1
P-Phone, *See* EBS
Pre-Qualification, 1-51, 2-7 to 2-9
PRI, B-3

R

Redial, 1-48
Reverse Charge, 1-56
RPOA, 1-56

S

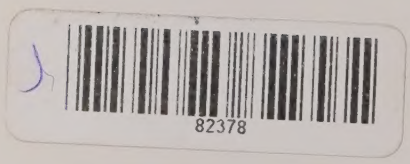
SAPI, B-3
Sealing Current LED, *See* Indicators
Set TEI, 1-61
Set Test Time, 1-24 to 1-25
Setup, 1-75, 2-2 to 2-6
Specifications, 1-80 to 1-85
    Operational, 1-81
    Physical, 1-80
Speed Dial
    Operation, 1-49
    Programming, 1-47
SPID, B-3, *See* Multipoint Operation
SS6, B-3
SS7, B-3
S/T Interface, *See* Interfaces
Status LED's, *See* Indicators
STP, B-3

Status Reporting, 1-37 to 1-46
Store, 1-47

T
TE, B-4
TEI, 1-50, 1-61, B-4
Termination, *See* Controls - Term Switch
Testing, 2-7 to 2-24
    at S/T Interface, 2-11
    at U Interface, 2-10
    NT1 Replacement, 2-24
    P-Phone, 2-17 to 2-22
    POTS, 2-23
TID, 1-44, B-4
Transport Layer, B-4

U
U Interface, *See* Interfaces
U Interface LED's, *See* Indicators
USID, 1-44, B-4

V
Voice Calls, 1-66 to 1-67, A-1 to A-2
Voice Turn-Up, 2-31
Volume Control, 1-56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